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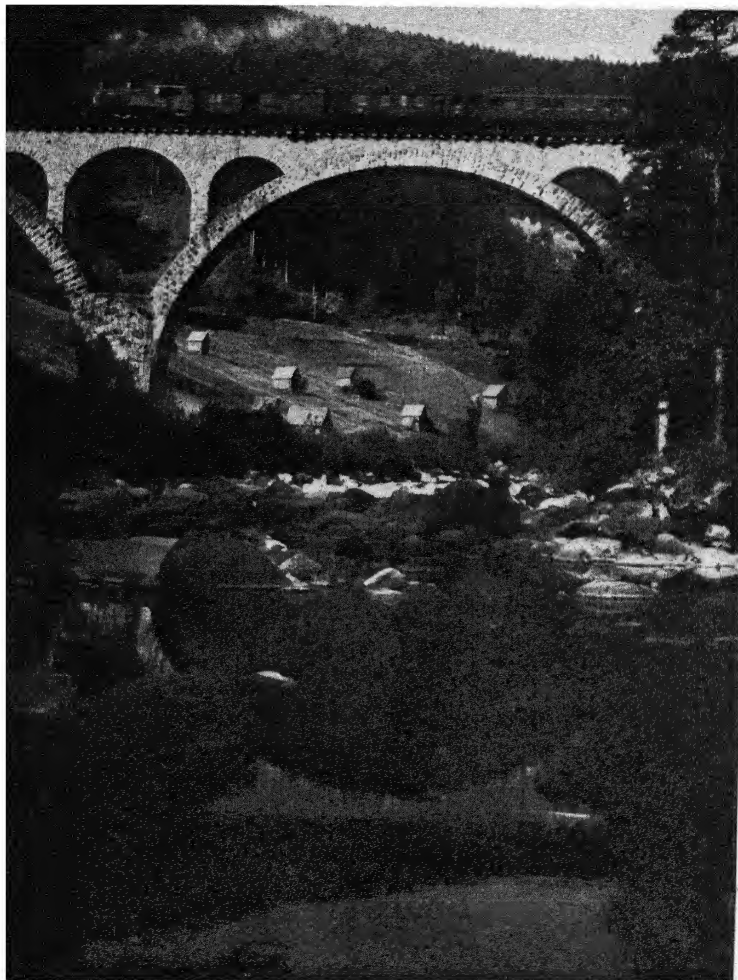


FIG. 1. THE BLACK FOREST

The rolling uplands of the Black Forest form ideal holiday country. The steep pitch of the roofs of the huts is accounted for by the heavy winter snowfall.

By courtesy of the German State Railways

Photo by Dr P. Woll

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General Editor : DR R. N. RUDMOSE BROWN

WESTERN EUROPE

BY

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PREFACE

THE present volume is an attempt to provide a regional description of Western Europe in sufficient detail for students preparing for the Higher School and the Intermediate examinations of the British universities. In no sense is it claimed that the treatment is complete, and a general knowledge of the elements of European geography on the part of the reader is assumed. It is the business of the more advanced student to make himself familiar with the contents of a large number of regional monographs which give in detail the facts of human geography in relation to physical and economic conditions. The purpose of this volume will be achieved if it serves as an introduction to the serious study of human conditions in post-War Europe.

Political and economic conditions have been fundamentally altered by circumstances arising out of the World War, and it is extraordinarily difficult to present a true picture of 'normal' post-War conditions. Several countries, apparently ruined beyond hope of recovery, pass through a brief period of insolvency and re-emerge, their currencies stabilized and their internal debts reduced, as world-Powers, while others show little signs of recovery. The problems of post-War Europe are largely of an economic nature, and it has been impossible sometimes to avoid emphasizing economic considerations to the exclusion of other and more interesting features of human geography. The attention of the reader is therefore directed to such standard works as Bowman's *New World* and Brunhes' *Human Geography* for details of human and political geography, which can receive only slight attention here.

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The writer desires to acknowledge his indebtedness to the published works of the principal European geographers and to the personal help of the official representatives of several of the countries described in the text. He must also express his gratitude for the great help he has received in the preparation of the text from Dr Rudmose Brown, without whose advice and assistance this volume would not have been completed.

L. B. C.

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CHAPTER I

GENERAL CONSIDERATIONS

EUROPE may be distinguished from the rest of the great land-mass of Eurasia by its varied relief, its highly indented coast, its temperate climates, the absence of deserts, and by the density, intelligence, and energy of its inhabitants. Although it covers less than 8 per cent. of the total land surface of the globe, it contains more than a quarter of the world's population. The reader is probably familiar with the general outline of the European coasts, and may have noted how short are the distances overland between the seas which fringe the continent. Between the Black Sea and the Baltic, the longest overland route between the European seas, the distance is barely 750 miles, and toward the west the continent becomes progressively narrower, and finally breaks up into a series of peninsulas and islands. It is in the west that Europe is most densely populated, and there is a direct connexion between the physical structure and the high development of the important centres of present-day civilization on the western shores.

PHYSICAL REGIONS

The physical structure of Europe is extraordinarily complex, and there are examples of almost every type of land-form, together with rock exposures of nearly every period of the world's geological history. At this stage the details of European geology need not be discussed, but an outline of the chief morphological divisions of the continent should be used as a means of making certain general comparisons between the different regions where man has made his home.

1. The **north-western highlands** include the Fenno-Scan-

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dinavian peninsula, parts of the north-west of Britain, and the islands which stretch through Iceland to Greenland and Western Spitsbergen, and consist practically throughout of Archæan plateaux which have been glaciated within comparatively recent periods. These rugged uplands supply the principal evidence in Europe of the earliest known movements of the earth's crust, the pre-Cambrian ('Lewisian' or 'Huronian') and the pre-Carboniferous ('Caledonian') foldings. Their unfertile nature and, with the exception of the coalfields of Spitsbergen and the ore-bearing districts of Scandinavia, their lack of useful minerals have made the north-western highlands regions of scanty human settlement. Throughout historical times man has been mainly a collector of fish, minerals, or lumber, or a nomadic hunter or pastoralist.

2. The **Great European Plain** stretches from the centre of England to the eastern frontiers of Europe, but though the surface from East Anglia to the Urals is one of practically uniform relief, it is possible to distinguish two sub-regions, which have different morphological characteristics.

(a) The western zone of denuded soils includes South-eastern Britain and the basins of all the rivers which enter the sea between the Garonne and the Vistula. Lowlands of denudation are formed by the wearing down of the surface to what is practically a plain at sea-level. This peneplain may consist of fractured and folded strata dipping at considerable angles from the surface. In some cases the superficial soils conceal layers dipping vertically, as in Anglesey, in North Wales. In any case, there is a great variety of sub-soils, and it is seldom that a homogeneous surface extends over a sufficiently wide area for large-scale farming such as is carried on in the prairie provinces of North America. Relatively small areas are suited to particular crops, and the characteristic agriculture is mixed farming, where there are both permanent pastures and cultivated arable fields. A map of the superficial deposits of the western parts of the European plain would reveal an almost endless variety of soils in most districts. The variety would be even greater if the covering of glacial drift was stripped from the underlying

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rocks, which are frequently of an entirely different nature, as in Northern England, where large areas are covered with a more or less uniform type of boulder-clay.

(b) The eastern zone of structural lowlands, or Russian platform, has remained unaffected by crustal movements from a very early geological period, and even in the places

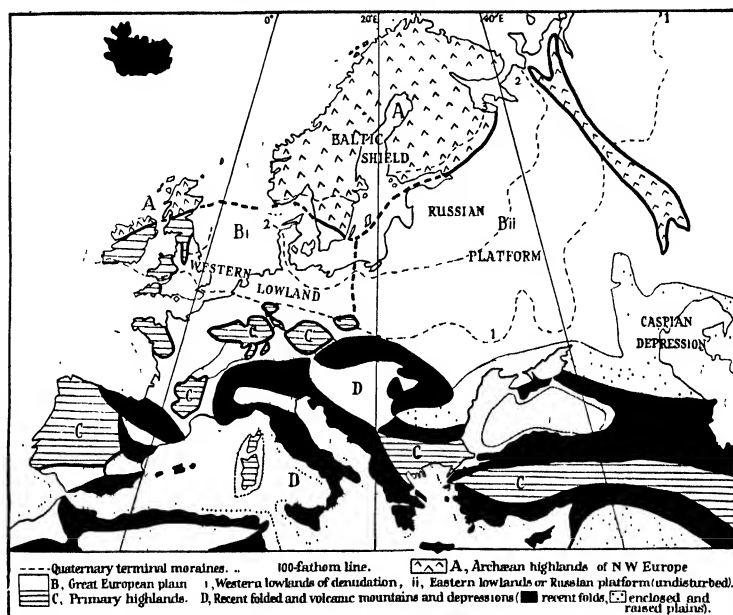


FIG. 2. PHYSICAL REGIONS OF EUROPE

where subsidence has allowed sedimentary deposits to be laid down the layers are practically horizontal, and give uniform surface conditions over large areas. In these circumstances enormous districts have a uniformity of surface soils which favours the development of large-scale arable farming, or, where the soils are of an infertile nature, of forestry. There are, of course, exceptions, particularly in the swampy districts, such as the Pripet marshes, which have not yet been drained. In general, however, one or two crops are grown over large areas—*e.g.*, rye and flax in North Russia.

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3. The **Primary highlands of Central Europe** form a belt of ancient blocks which stretches from Southern Ireland through South Wales and Cornwall to Brittany, the central plateau of France, the Vosges, Ardennes, Harz Mountains, Black Forest, Bohemia, as far as the Rhodope Mountains of the Balkan peninsula, with outliers in Asia Minor and the Spanish meseta. At the end of the Primary period there stood a mighty chain whose extent can be seen by joining up the parts which still appear above the surface. Afterward it appears as if the forces which cause crustal movements remained quiescent until the great folding of the Alpine chains which took place toward the middle of the Tertiary period. These later crustal movements expended their energy against the older uplands, which long consolidation had rendered less plastic. According to Suess the Carpathians overrode the older blocks, but in other parts fracturing took place, and large areas subsided, leaving ancient blocks to mark the former extent of the Hercynian¹ folding.

According to the same authority, the basins formed when subsidence occurred sometimes ended in long, straight faults, such as determined the course of the upper Danube. At other subsidences deep trenches, such as the Rhine Rift Valley, came into existence, but in every case where the Primary blocks remained as uplands they were worn down by erosion, and their surface soils removed, leaving plateaux of barren pastures and heaths. In the moorland districts so formed the farms are large in area, but isolated, and the population has always been scanty. Throughout historical times there has been a constant stream of emigrants from the highlands to the lowlands, and especially to those areas of subsidence where newer and more fertile deposits offer means of livelihood.

Until a comparatively recent date the only considerable human settlements within the highland regions were in the valleys, where sufficient alluvium had accumulated for small-scale farming. Even here the population was seldom dense, and a few of the inhabitants were generally employed in manufactures, which were often based on local water-power. Still

¹ After the Harz Mountains.

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fewer people were engaged in mining, while after a succession of bad harvests both brigandage and emigration increased. It was not until the end of the eighteenth century that the coal and iron deposits which occur in basins in many of the plateaux were used in the production of manufactured goods. During the nineteenth century these coal-bearing areas stimulated a growth of population which resulted in the conversion of poor agricultural districts into great industrial regions which maintain millions where agriculture alone could barely support thousands.

4. The **folded mountains and depressions of Southern Europe** consist of chains of relatively young mountains which enclose the Mediterranean and Black Seas. They include the Atlas, Pyrenees, Alps, Apennines, Caucasus, and Carpathians, and their slopes are clothed with forests and pastures. Except where crustal folding and subsequent erosion have exposed older rocks there is little mineral wealth, though several districts on the flanks of the great folds contain deposits of petroleum in rocks of Secondary and Tertiary age. Volcanic action and earthquakes have continued to the present time, and prove that the period of mountain growth in this region has not yet ceased.

The soils formed from the rocks of recently folded mountains are frequently more fertile than those of the older uplands, and it is sometimes possible to carry cultivation to within a short distance of the snow-line. Nevertheless, most of the people living in the great chains are engaged in pastoral and forest industries, and though hydro-electric power developments have caused a great expansion of mountain industries during recent years, the mountains are very sparsely populated, at any rate in winter.

CLIMATIC REGIONS

Climate is determined by latitude, nearness to the sea, ocean currents, prevailing winds, the position and direction of mountain ranges, the general elevation above sea-level, and the nature and slope of the land surface. In Europe the great length of coastline gives full play to the influence of

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the surrounding seas in restricting changes of temperature in the neighbourhood of the coastal districts, though toward the east, where oceanic influences are slight, the chief factor affecting climate is latitude. Nevertheless, the absence of great north-south ranges, which in North America limit oceanic influences to the neighbourhood of the west coast of British Columbia and the north-western states of the United States, allows the prevailing westerly winds to carry moisture far inland, and there is nothing in Europe to correspond to the climate of Alberta and Dakota.

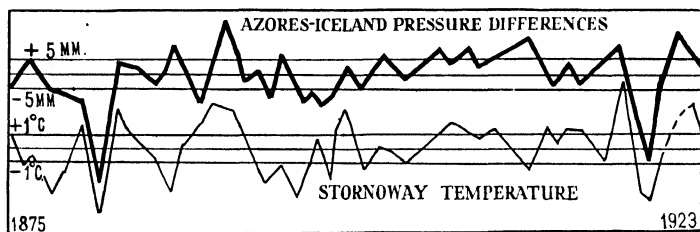


FIG. 3. GRAPH SHOWING THE RELATION BETWEEN THE AZORES-ICELAND PRESSURE DIFFERENCES AND TEMPERATURE CONDITIONS AT STORNOWAY

I. North-western Europe has the climatic conditions which are typical of cool west coasts, the summer temperatures being lowered by the cloudy condition of the atmosphere, which is due to the almost constant movement of air currents from the ocean to the land. Rain occurs at all seasons, though the western coasts are much wetter in winter than the other parts, because the Siberian anticyclone seldom extends beyond the coasts of continental Europe, while the coastal districts come under the influence of deep winter depressions. It should be remembered, however, that every month has on occasion been the wettest in the year at Greenwich. In winter the north-west coasts of Europe are prevented from becoming cold by the depressions which cross the Atlantic in response to fluctuations in the pressure differences between Iceland and the Azores.

The mechanism of the relationship between Atlantic pressures and climatic conditions in Europe is fully explained in

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meteorological works to which the reader may refer, and it is sufficient to state here the actual climatic conditions, without a full discussion of their cause. North-western Europe may be divided into three climatic sub-regions: (a) the Atlantic coast-lands, (b) the interior plains of France, Belgium, Holland, Germany, and Southern Scandinavia, and (c) the Scandinavian highlands. These will be discussed more fully in Chapter II.

2. **Eastern Europe** has a continental climate, the winters becoming increasingly cold and the rainfall more scanty toward the east and south-east of the Russian plain. A large part of the total precipitation occurs during the summer half-year, but the rainfall occurs irregularly, and is unevenly distributed. In winter the intensely cold condition of Northern Eurasia gives rise to the great Siberian anticyclone, so that the winters are dry and bright, with only a moderate snowfall.

Five climatic sub-regions may be noted.

(a) The *Arctic coast-lands*, where the average temperature of the warmest month is less than 50° F., the isotherm of which marks the limit beyond which trees cannot grow except in well-sheltered situations. This limit almost coincides with the Arctic Circle in Europe, and the region to the north has a vegetative season of less than three months, so that, in spite of the almost continuous summer sunlight, agriculture is impossible, and tundras form the principal vegetation.

(b) The *North Russian Climatic Region* lies between the summer isotherms for 50° F. and 70° F., and has cold winters, though some rainfall and fog in the cold season prevents drought, while the warm season is too short to evaporate the moisture of the subsoil required to maintain forest growth. Where the forests have been cleared there is generally sufficient summer heat and rainfall to allow the growth of grasses, roots, and cereals, and, in the extreme south, of sugar-beet.

(c) *South Russia* has hot summers, with great evaporation, and there are periods of very dry cold weather in winter. The rainfall is just sufficient for wheat, and in favourable years the steppes produce a great surplus of

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grain. In many parts, however, the rainfall is uncertain, and large areas still remain as natural grasslands.

(d) The *Caspian Depression*, in the extreme south-east of Europe, lies below sea-level and has very little rainfall (Astrakhan six inches per annum). The climate is extreme, but, because of the low latitude, the winters are short, being modified by the nearness of the waters of the Caspian Sea, which never freezes.

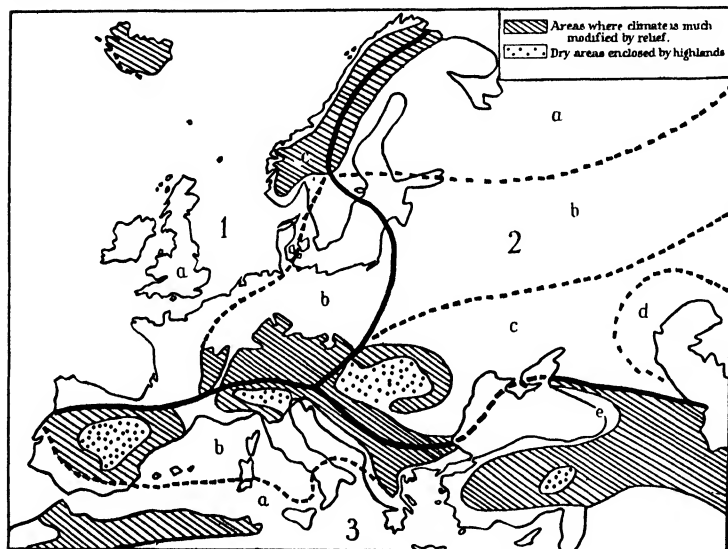


FIG. 4. CLIMATIC REGIONS OF EUROPE

1. North-western Europe: *a*, Atlantic coast; *b*, interior plains; *c*, Scandinavian plateau.
2. Eastern Europe: *a*, Arctic coast; *b*, North Russia; *c*, South Russia; *d*, Caspian Depression.
3. Mediterranean region: *a*, winter rain region; *b*, autumn rain region.

(e) The *Caucasus Mountains* show the zones of climate which occur in highland regions, and the rainfall is sufficient for the growth of deciduous forests and pastures similar to those of Central Europe.

3. The **Mediterranean region** has a typical warm west coast climate, with equable conditions of temperature, ranging from 40° F. to 75° F., the maximum rainfall occurring in the autumn in the north of the Western Mediterranean,

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and, with the exception of Crete and Cyprus, which have more than half of their rain in summer, everywhere else in winter. The Spanish meseta has a second maximum in spring, while the plateau of Asia Minor has conditions intermediate between those of Central Europe and the salt steppes of the Caspian depression. On the south of the Mediterranean the rainfall becomes less, and the greater part of North Africa is desert, its infrequent rains being caused mainly by local thunderstorms and by the passage of depressions along the Mediterranean Sea.

The Central European highlands have a great diversity of climates, but throughout the rainfall is sufficient for the growth of forests and for pastures on the level stretches both of the valleys and of the upland plateaux. In general the climatic conditions are of a transitional nature, the north-western parts having rain at all seasons, the north-eastern districts having their maximum rainfall in summer, while the southern parts have autumn and winter rains. Most of the modifications of climate are caused by differences of relief, and nocturnal radiation frequently gives rise to inversions of temperature, whereby the valleys are often colder in winter than the mountain slopes. The accumulated cold air falls into the valleys as katabatic winds, such as the 'struma' and 'bora.' The passage of deep atmospheric depressions along the north of the highland region frequently causes air to be drawn down the northern slopes of the Alps, giving rise in certain Swiss valleys to hot, dry *Föhn* winds, which cause early melting of the snows and promote unusually early vegetative growth. Depressions in the Mediterranean cause comparable winds in the south. The most severe winters are found in those valleys which open to the north-east. The Tamsweg valley, for example, is only 3300 feet above sea-level, but has a January temperature of 17° F., a condition which has earned for it the title of the Austrian Siberia. On the other hand, southward-facing valleys have mild winters, and the winter climate of the High Alps is often delightful, the mountain resorts being above the cloud-level, enjoying very bright sunshine.

In this medley of climates the Po valley and the Danube

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plains stand out as being different from the mountain areas, which always have daily extremes of temperature. The Po valley has a well-marked inversion of temperature in January, and the river has more than once been frozen over. The rainfall is more regularly distributed throughout the year than in other parts of the Mediterranean area, and there is a maximum of rainfall in summer. The Hungarian and Rumanian plains have a climate similar to that of the steppe region of Russia and have most of their rain in summer, the winters being dry and cold. Their total rainfall is much less than that of the surrounding mountainous districts.

VEGETATION REGIONS

Plant life depends on both edaphic and climatic conditions. The principal edaphic factors are the composition and the nature, whether solid or liquid, of the medium in which the plant grows. The climatic factors are heat, light, rainfall, and wind, which expedite or hinder germination, growth, and ripening. The whole of Europe has conditions which allow plant growth though there are areas where the conditions are none too favourable for either plant or animal life.

1. **Arctic Tundras and Alpine Fjelds.** Along the northern coast-lands of Eurasia the only plants which are able easily to withstand the dry, icy winds, the long winter night, and the permanently semi-frozen condition of the subsoil are low-growing herbaceous plants and mosses and lichens. Tree growth is extremely slow and confined to specially favoured situations. Mosses grow where the soil is moist, and lichens where the surface consists of porous sands derived from the granitic rocks. In the Scandinavian uplands plants assume a cushion-like habit, because of the strong winds. Owing to the short period during which vegetative growth is possible, most of the plants mature rapidly.

In the tundra the vegetation offers little food except to the reindeer, which is kept in half-wild herds by nomadic groups of Lapps. The only settlements are situated in the river valleys and on the sea-coasts. The fjelds, or mountains, are practically uninhabited, except during the short

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summers, when they are visited by Lapp and other herders. Most of the inhabitants combine fishing with reindeer-herding. In one or two favoured valleys toward the north of the Gulf of Bothnia a little primitive agriculture is practised and a few cattle are kept.

2. The **coniferous forests** extend from the northern limit of trees to about latitude 50° N. Toward the north and east

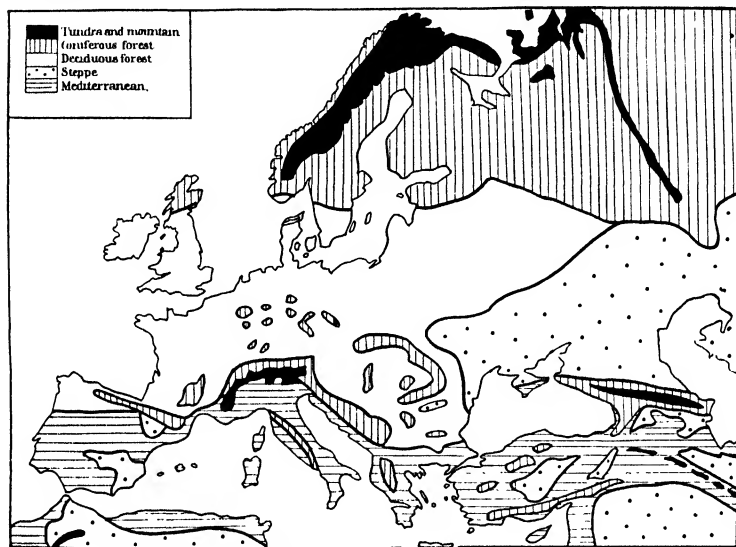


FIG. 5. VEGETATION REGIONS OF EUROPE

the shortness of the period of vegetative growth—from three to four months—limits the number of species which can grow to the spruce, fir, and larch. All offer little leaf surface to the winds, and so reduce transpiration. There is no absolutely dry season, and because of the low rate of evaporation sufficient moisture is retained in the soil to maintain the life of the trees. The summers are not dry enough to parch the vegetation, and the winters are not sufficiently cold to check growth. The abundant snowfall acts as an additional protection to the vegetation. The birch and aspen occur throughout the coniferous region, and dwarf birches extend beyond

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the northern limits of the forest belt. Toward the west, in Scandinavia and the Scottish Highlands, the rainfall is heavier and the vegetative season much longer, so that the Scots pine, Norway spruce, and European larch are grown. Conifers are not, however, confined to these northern regions. They are found in the Mediterranean lands and elsewhere if conditions are suitable. A large part of the natural pine-forest of the West has been cut down, and many of the forests of Germany and the Baltic states are the result of cultivation. In Britain deforestation has been carried on to such an extent that it is now economically possible to introduce new conifers—*e.g.*, the Douglas fir of North America. In Russia, however, lack of transport facilities hinders the exploitation of the interior forests, and on an average not more than one-quarter of the annual growth is cut. In Sweden and Norway more than the annual growth is cut. In Finland and in the other Baltic states the amount of timber cut is restricted by law, in order to conserve the timber supplies. The coniferous forest-land when cleared of trees is not of great value for crops.

3. The **deciduous forests of Western and Central Europe** extend from the Atlantic coasts to the Black Sea. Throughout this region frosty conditions generally occur in winter, though along the south-west coasts of the British Isles there are some sheltered places where Mediterranean evergreens, such as the arbutus, rhododendron, and the hardier palms, flourish. On the western seaboard, however, strong winds prevent the growth of trees in exposed situations, and it seems probable that Western Europe was less densely forested than Central Europe. Its natural park-lands made the task of clearing the ground for agriculture relatively easy, and at the present day a large part of the former forest is under grass and farm crops. The typical tree throughout Western and Central Europe is the oak, with which ash, maple, and elm often occur. Some forests are entirely of beech. Clearing is rapidly proceeding throughout Central Europe. Czecho-Slovakia, Yugo-Slavia, and Austria have important timber industries.

4. The **Mediterranean region** has mild, rainy winters and

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hot, dry summers, and is protected from the coldest northerly winds by the ranges of mountains which stretch from Spain to the Caspian Sea. The annual rainfall is generally more than twenty inches, and, as this occurs chiefly in the cool season, it is generally sufficient to maintain light evergreen woodlands of cork-oak, stone-pine, firs, cypress, and cedar. The trees are seldom large, and generally possess small leaves. In spring there is a great wealth of bulbs, which die down with the approach of summer. Grasses grow only during the winter half-year, and during the summer months become brown and parched. Only those plants which have special means of resisting drought flourish during the dry summer. Large areas of the original forest have been destroyed. When the woods are cut down or destroyed by fire they are replaced by dense scrub, called 'macchia' or 'maquis.' Where the soil consists of limestone the scrub is drier and more open, with occasional oak-trees. This is called 'garigue,' and is found in the *cause* districts of France, in Greece, and in the karst areas of North-east Italy. Above 2000 feet the Mediterranean woods merge into forests of deciduous trees interspersed with Alpine meadows, which provide summer pasturage for cattle.

The overstocking of the crops and the destruction of the original forests have led to the wearing away of the slopes of the mountain districts, and whole regions have been impoverished. Moreover, the water-supply is no longer conserved, and unless irrigation is practised agriculture is carried on with difficulty. Areas with very low rainfall are naturally steppes, with scanty pasture. In the Spanish meseta part of the steppe area is now being cultivated by dry farming and continuous cropping, while the Po valley is so well irrigated that practically all trace of the original steppe vegetation has disappeared.

5. The **steppes of Russia, Rumania, and Hungary** are natural grasslands, which extend wherever the rainfall is less than twenty inches per annum. Growth is limited by the drought and excessive heat of summer. As the light rainfall occurs chiefly in spring, trees cannot thrive. Where irrigation is possible the 'black earth' is capable of producing

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large crops of grain, but on the poorer soils near the Caspian Sea the only use for the steppe is as natural pasture.

With the exception of the tundra and Alpine zones the vegetation regions have been modified by man. Rye and flax have been introduced into the pine-forest region of Russia and the Baltic states. Toward the west, where there is an abundance of rainfall, oats and roots have been planted

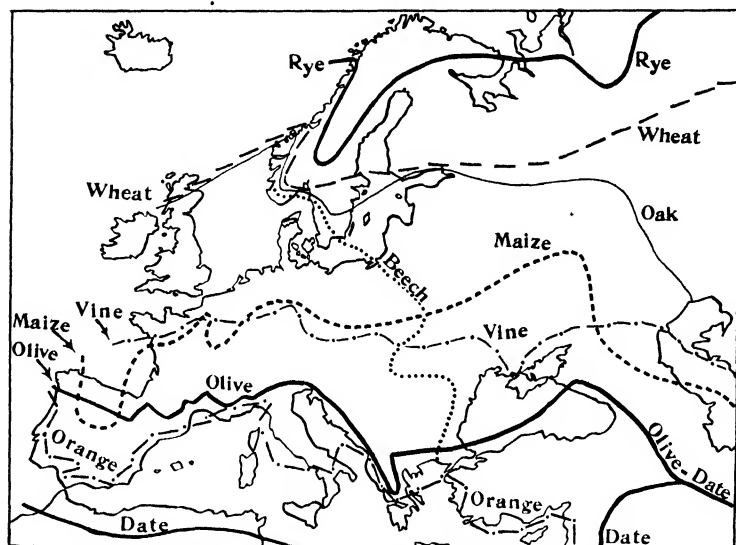


FIG. 6. NORTHERN LIMITS OF CERTAIN ECONOMIC PLANTS

in the areas from which the deciduous trees have been cleared. A very large part of the deciduous woodland has been destroyed, and the area of pasture-land has been much increased during historic times. Some of this former forest-land has a summer warm and dry enough for wheat. Climatic conditions are favourable for maize from Aquitaine through the lowland districts of Central Europe as far as the Russian steppes. Except in the middle and lower plains of the Danube it is chiefly cultivated for local consumption. The olive, orange, and vine are typical crops of the Mediterranean region, but the vine is also cultivated throughout

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Central Europe wherever local conditions of soil and climate are suitable. Mountain regions everywhere are used for grazing, and in those countries where the mountains are covered with snow during the winter months the upland regions are used as summer pastures, 'transhumance' being the name applied to the periodic and alternate displacement of flocks and herds between two regions of different climate.

THE RACES OF EUROPE

Europe is the home of the descendants of many of the different racial groups which have occupied it since the great ice sheets withdrew and gave place to forest- and grass-land and allowed hunters, pastoralists, and tillers of the soil to settle. There are few survivors of the earliest human types, except in remote or inaccessible districts, where local conditions have prevented their assimilation into other groups. Many of the earliest peoples are known only in fossil form, but it is possible to distinguish three main groups which have persisted to the present day.

1. The **Mediterranean type** consists of long-headed, olive-skinned, wavy-haired peoples, small both in frame and in feature. The earliest long-headed people reached Europe across the land bridges which formerly connected Spain and Italy with Africa. The Mediterranean peoples are by no means confined to the Mediterranean region, nor do they occupy the whole of the region, but they reach their fullest development on certain shores of the Mediterranean Sea.

2. The **Nordic group** is also long-headed, but tall, fair, and muscular. Its original home has been the subject of much speculation and controversy. It may even be a branch of the Mediterranean type that has lost its heavy pigmentation. Even the name 'Nordic' has been made the subject of dispute, but it is certain that for many centuries in the Scandinavian peninsula and in the countries which border the North and Baltic Seas the great majority of the people have possessed 'Nordic' characteristics. In the western parts of the British Isles are many people of mixed race, who possess both Nordic and Mediterranean characteristics.

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3. The 'Alpine' race appears to have spread from the uplands of Asia Minor into the steppe regions, the Balkans, and the southern highlands of Europe in general. Peoples of this type may be distinguished by their muscular, thick-set bodies, their dark, straight hair, their whitish skins, and their broad heads. In the Balkans they are mixed probably with peoples of Mongolic stock. The steppes and pasturelands, whether in Russia or in the Alps, are still occupied by these broad-headed peoples, who were the last of the great races to move into Europe. Mixed with Nordics they are found widely in the British Isles.

Generally speaking, the races of the north of Europe use Teutonic languages, but it is impossible to judge the boundaries occupied by the various races from the languages they speak. Often a small body of invaders has succeeded in imposing its language on the country it has conquered, but in other cases after a very short space of time intermarriage has resulted in the disappearance of its language and all physical traces of the invading race have been lost. In the case of the Basque race, one of the early Mediterranean types, all trace of the race has gone though the language has been preserved in the Western Pyrenees. All the other languages of Europe are of Indo-European origin, and the three main groups—Romance, Teutonic, and Slavonic—approximately correspond to the three chief racial types. It is certain that on both the north and the south of the mountain zone of Central Europe there has been a great deal of mingling and mixing of the different races. The mixing has been most marked in the west, and especially in France, the Low Countries, and in the British Isles. In almost any class of scholars in England it is possible to distinguish long-headed and broad-headed children, but in the large towns it is seldom that absolutely pure types are to be found. Here and there, however, in the more remote country districts there appear to be little groups which conform more particularly to one special racial type. In Kent and Surrey, for example, there are a large number of tall, fair, long-headed people, while in the north and east of England the bulk of the population is also long-headed,

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fair, and blue-eyed. In the west, and especially in the upland districts of Cornwall and Wales, there are darker people, who possess either broad or long heads, but everywhere there are considerable numbers who cannot be classified.

In Eastern Europe the races are mingled rather than mixed, and as each group tends to live in its own villages and speak its own language, and as many of the different groups are at widely different stages of cultural development the Balkan area presents political problems of the most delicate character. The problem of racial minorities has received a good deal of attention during recent years, but it is only in those parts where the subject races have succeeded in raising themselves to a cultural level at least equal to that of their rulers that they have achieved national independence by their own unaided efforts. As a rule the first step taken in awakening national consciousness has been the creation of a national literature, and this has been done with conspicuous success in Bohemia and Finland.

4. The **Finns and Esths** are of the same racial type as the Lapps and Ostyaks, and claim racial affinity with the Magyars of Hungary. They are Mongolic in origin, and appear to have come from the region which extends between the Pripet marshes and the western slopes of the Urals. The tracts round the Oka, the bend of the Volga, and the Kama were probably occupied by them four thousand years ago, as they still are, to a certain extent, at the present day. Their dispersal to the Baltic coast, to the Hungarian plain, and to the shores of the Arctic Ocean took place early in the Christian era. The Carelians, who live to the east of Finland, are even more Asiatic in appearance than the Finns themselves.

The people who lived round the bend of the Volga migrated westward with Attila, while others settled on the Danube, along with the Alpine (Slav) inhabitants who called themselves Bulgarians in the seventh century. The remnants founded the Bolgar state of the Volga during the ninth and tenth centuries, and this region still contains Cheremisses. The Ostyaks and Voguls, who migrated to the north-east, and the Zyrians, who settled on the Pechora in the eleventh

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century, declined in culture, while the Magyars, to whom they appear to be closely related, never lost their national consciousness, even during the period when their country was overrun by the Turks. The Turks themselves, of whom there are few in Europe; are descendants of the last wave of Mongolic invaders.

EUROPEAN RELIGIONS

In almost every European country the adoption of Christianity was marked by an admixture of pagan rites and ceremonies with those of the new Christian Churches. The greatest of all the missionary Churches was that of Rome, which carried with it the unifying influence which was so marked a feature of the Roman Empire. During the decline of the Roman Empire its roads began to show signs of wear and decay, and as communications became more difficult it was found to be no longer possible to rule the Empire from its original centre, and a second capital was chosen at Constantinople. Rome fell in the fifth century, but Constantinople held out for another thousand years.

In both cases, however, the spiritual power which had grown up alongside the temporal power and had been fostered by it survived, and has since extended its influence far beyond the boundaries of the original Empire, either Eastern or Western. A religious map of Europe would therefore show two zones, the Latin Churches in the West and the Orthodox and Russian Greek Churches in the East, but between the zones it would be necessary to show an intermediate region which is connected with both and in which the Uniate, or Greek Catholic, form of Christianity prevails.

In the days when the Roman Catholic Poles were engaged in the conquest of their Orthodox neighbours in Transylvania and the Ukraine the difficulty of religion was settled by a compromise, the Orthodox Greek Christians accepting the authority of the Pope in return for being allowed to retain their traditional forms of religious worship. It was a settlement made for political purposes, and may be contrasted with that of the Elizabethan Church, made at about the same time. We find, therefore, that to the complicated condi-

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tion of affairs caused by the existence of different racial groups in Eastern Europe there was added the dissension due to no less than three different forms of Christianity.

The difficulties were increased by the Turkish invasions, which gave rise to very considerable Moslem populations within the Balkan peninsula. Moreover, even after Turkish power had waned the Sultan found it possible to exert pressure on the Balkan peoples who had obtained their independence by creating a Bulgarian Exarch to counterbalance the influence of the Greek Patriarch at Constantinople. Even now the religious factor in the political difficulties of the Balkan region still exists.

POLITICAL FRONTIERS

The boundaries of the European states sometimes have a geographical basis, but quite frequently the influence of physical and economic forces has been overcome by the personal ambitions of active rulers. The pre-War frontiers of Europe were largely dynastic in origin, and it was only in those states where Roman civic traditions were strong that linear frontiers separated nations. Elsewhere the natural frontiers are zones. This is especially true where rivers form the boundaries, and particularly in the valleys of the Rhine and Danube, across which rivers Roman and Teutonic influences spread in opposite directions. Those responsible for the drawing up of the new European frontiers endeavoured to apply the idea of the nation-state to Central Europe and the Balkans, but unfortunately the index of nationality chosen was that of language, and insufficient attention was paid to economic facts.

Some of the peoples which the Peace Treaties attempted to make into nations no longer possessed any consciousness of nationality, and in South-east Europe, where many separate groups mingled without fusion, the work of frontier rectification offered extraordinary difficulties. In Slovakia, for example, there are Czechs, Slovaks, Germans, Poles, Magyars, and Ruthenians, and, in addition, Jews and gipsies. The Slovak peasants live at a stage of cultural development

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which differs greatly from that of the Czechs. The German townsfolk and farmers retain their typically German institutions, such as opera-houses, while the Jews and the gipsies form entirely different castes.

Great as the difficulties are in Czecho-Slovakia, the task of making nations of the Yugo-Slav peoples and of the Rumanians is even greater, and it was found impossible to separate the 'racial' groups, however carefully the boundary-lines were drawn. The result is that considerable minorities have been left on the wrong sides of the new frontiers. The problem of racial minorities has become important, and in the case of Greece and Turkey there has been an actual exchange of people, Turks being deported to Asia Minor and Greeks to Macedonia. In most of the other cases minorities have remained under a foreign flag—a constant source of irritation, and sometimes of danger. Nowhere is the problem more acute than in the new Hungary. This country has been reduced from an area of 125,600 miles, inhabited by 21,000,000 people, to about 35,000 square miles, with 7,500,000 inhabitants. It has lost practically all its mineral resources, and possesses no direct outlet to the sea. Many Magyars find themselves outside the new frontier in Rumania and in Yugo-Slavia, the Serb-Croat-Slovene kingdom.

In the case of several areas linguistic principles were abandoned in favour of strategic ones. Thus the Southern Tirol has been annexed by Italy in order to give that country an easily defended line on the headwaters of the Adige valley, and attempts to Italianize this district have aroused very bitter feelings not only in the other parts of the Tirol, but also in other parts of Austria and in Germany. In connexion with the outstanding frontier problems of Europe, which were not satisfactorily decided by the Peace Treaties, reference should be made to President Wilson's address to the United States Senate in January 1917.

No peace can last, or ought to last, which does not recognize and accept the principle that Governments derive all their just powers from the consent of the governed, and that no right anywhere exists to hand people about from potentate to potentate as if they were property. . . . Any peace which

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does not recognize and accept this principle will inevitably be upset. It will not rest upon the affections or the convictions of mankind. The ferment of spirit of whole populations will fight subtly and constantly against it, and all the world will sympathize. The world can be at peace only if its life is stable, and there can be no stability where the will is in rebellion where there is not tranquillity of spirit and a sense of justice, of freedom, and of right.

COMMUNICATIONS

The earliest ways of migration in Europe avoided the densely forested and marshy regions as far as possible, because man did not possess suitable cutting tools. It was not until the Bronze and Early Iron Ages that any considerable progress was made in the clearing of the forests. Three great routes appear to have been used by the migrating tribes: (i) the belt of loess which extends from South Russia up the Danube basin from Rumania to the neighbourhood of Ulm, and thence in smaller patches along the upper Rhine and Neckar to the Rhine Rift Valley and the Rhône; (ii) a more northerly belt of loess soils, which extends from the Ukraine through Galicia, Upper Silesia, Moravia, and Bohemia, to Saxony, round the north central uplands of Germany to the Ruhr, the Hervé plateau, Hesbaye, Hainaut, Picardy, and the Beauce district, which lies to the south of Paris; and (iii) a route along the coasts of the Baltic and North Seas, which could be followed only by peoples who understood the making and use of boats.

It is interesting to note that these belts of light soils on which tree growth was scanty met in the neighbourhood of the Paris basin, which appears to have been the natural meeting zone of the migratory tribes since the earliest times. As these ways of migration were also the most fertile areas they were more densely peopled than the mountains, forests, and marshes which hedged them in, and as they supported the densest populations it is probable that the earliest commercial routes followed the same directions.

North-south routes appear to have developed later, and the introduction of iron tools and the growing trade in amber

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account for the development of the early routes between the Baltic and the Mediterranean, though these were of small importance until river navigation developed. The Roman period was noteworthy for the construction of the excellent system of roads which centred on Rome, but with the decline of Roman power these roads fell into decay, and river navigation became the principal means of commercial communication. Throughout the Middle Ages the chief commercial centres were the great bridge-towns.

Western Europe was remote from the great centres of world-trade, and the great routes were the Mediterranean, Black, and Baltic Seas. The important land-routes were used by pack-horses, and centred on Venice, Genoa, Marseilles, and Constantinople, while camel routes in Africa and Asia Minor led to the ports of North Africa and the Levant. Ships were small, and as the camel cannot carry more than 400 lb. the goods carried consisted of relatively light and expensive articles. The pack-horse can carry less than the camel, and, as the Alpine passes were blocked by snow in winter, the routes through the mountains were chiefly used in the summer months. Moreover, the rivers were frequently blocked by ice, at any rate in Central and Eastern Europe, and the total tonnage of goods carried annually cannot have been large. With the discovery of the ocean-routes ships grew larger and trade rapidly increased and began to centre on the Atlantic coasts. The ports of the Bay of Biscay and the North Sea now required a better system of inland communications, and canals, roads, and later railways were constructed to facilitate distribution. Naturally, the best systems of inland communication grew up near the great ports of Western Europe. In many parts of Eastern and South-eastern Europe methods of inland communication have improved little since the Middle Ages, and transport is generally both costly and slow. The present disturbed state of Eastern Europe has checked the development of motor routes similar to those which are rapidly revolutionizing the methods of internal communication throughout Western Europe. The steam lorry can carry from five to six tons, and the motor lorry from two and a half to four tons at a

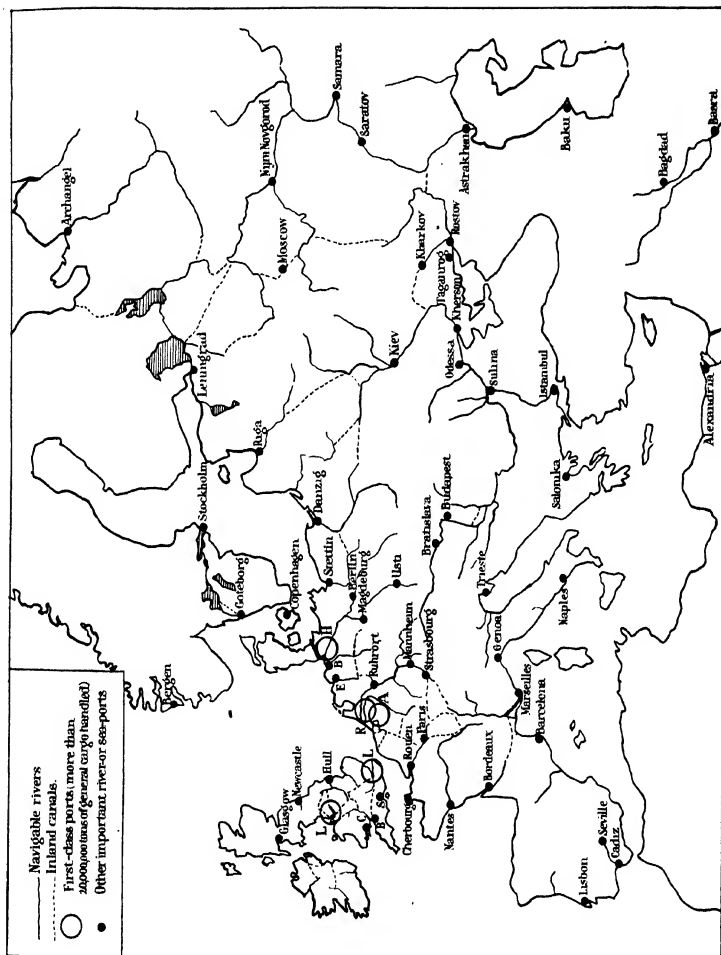


FIG. 7. NAVIGABLE WATERWAYS OF EUROPE

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speed of five miles an hour over metalled roads, and the internal-combustion tractor can draw loads of from four to six tons from fifty to a hundred miles per day over indifferent roads without refuelling. It appears, therefore, that in the absence of railways the countries of Eastern Europe will be able greatly to increase their external trade by developing motor transport in connexion with their navigable rivers. Russia, however, also needs new trunk railways, with elevators at the railway stations for the transhipment of grain in bulk.

In the exchange of foods and raw materials for manufactured goods Europe is more favoured than America. Its many peninsulas and irregular coastlines make communications between the interior and the sea both easy and cheap. It is natural therefore that the greatest trade-routes of Europe should be water-routes, and that there should be a smaller mileage of railway track than is to be found in Canada and the United States, where there is only one great inland waterway—the Great Lakes. Including the great rivers of Russia, Europe has about 100,000 miles of inland waterways.

The southern and the northern seas of Europe furnish two heavy-traffic routes, and these are fed by the secondary heavy routes, rivers, canals, and railways. The southern route is poor in secondary feeders by river and canal, though the valley routes which open to the Mediterranean are followed by important railways. The Rhône, Ebro, Po, and Vardar are of relatively little importance, while the Danube suffers from ice, the delta at its mouth, and the obstruction called the Iron Gates. Nevertheless, the Danube is important, and by means of a ship canal ocean-going ships can enter its mouth and penetrate into the heart of Europe. The Black Sea is considerably better in its feeders than the Mediterranean, and its rivers, the Dniester, Don, and Dnieper, and the southern railways of Russia allow grain and ore to be assembled at the ports of Odessa, Kherson, Nikolaiev, Taganrog, and Rostov, though most of these ports are ice-bound for several weeks each year and their port equipment is inadequate.

Two distinct areas can be noted in the Mediterranean and

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Black Seas. The eastern countries export foods and the western countries, Spain, France, and Italy, which have developed manufactures, are food-importers, and no longer produce a large surplus of foodstuffs and raw materials. This means that British ships can no longer obtain bulky return cargoes in exchange for coal in the Western Mediterranean, and often have to proceed in ballast after leaving Genoa in order to seek bulkier freight in Asia Minor, Turkey, and the Black Sea. The opening of the Suez Canal revived the importance of the Mediterranean as a highway of world commerce, and there is a large and increasing traffic between the ports of North Africa and Marseilles and the ports of Italy, Spain, and Greece. Moreover, manufactured goods from Italy and France are sent eastward in exchange for the grain, hides, ores, and mineral oil of the Black Sea region.

The northern route through the North and Baltic Seas receives more navigable rivers than does the Mediterranean, and two of the rivers, the Elbe and the Rhine, are of first-class importance and form cheap outlets for the products of Central Europe. With the Seine and the Scheldt, these rivers serve the greatest industrial region in Europe, and may be compared with the Great Lakes and the Hudson valley of North America. The commodities exchanged between the countries of the Baltic and those of the North Sea are more equal in bulk than are those of the Mediterranean trade. Timber is exchanged for coal, and in this trade Britain enjoyed a virtual monopoly until the close of the World War. The return cargoes of timber, flax, iron ore, and Central European goods almost fill the ships, which normally carry to the Baltic and Scandinavian seaboard about 25,000,000 tons of British coal per annum. At the present time, owing to the disturbed state of trade in Eastern Europe, Britain exports much less to the Baltic region than in pre-War days, though the present tendency is toward a gradual resumption of former conditions.

Besides the rivers there are numerous canals, light railways, and motor routes which serve the areas near the mouths of the North Sea rivers. These act as collecting agents for the manufactures of France, Belgium, and Germany,

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as well as for Switzerland and Czecho-Slovakia. They also act as distributors of the raw materials and foods imported at the world-ports of Rotterdam and Hamburg. Antwerp is less suited to import trade than to the collection of the mixed cargoes drawn from Flanders and the Rhine lands for export. London, Liverpool, Hull, Bristol, Glasgow, and Leith still control the bulk of Britain's foreign trade, but Southampton has become the chief British Atlantic passenger port.

The Baltic Sea may be contrasted with the Mediterranean in that it is a blind alley, and, owing to the relative freshness of its waters, its northern and eastern arms are icebound for several months of the year. The Baltic trade is therefore of a seasonal nature, and its ports are less suitable for the warehousing of goods and raw materials obtained from other continents. As the Baltic ports are not suited to *entrepôt* traffic, Copenhagen acts as the principal *entrepôt* for Scandinavia and for the smaller Baltic states. The North Sea ports are ice-free, and possess excellent inland communications, with the result that many of them are important *entrepôts*. Moreover, the North Sea differs in the character of its local trade, in that it is the second greatest fishing ground in the world.

MAJOR ECONOMIC REGIONS

Economic regions are those where the foundations of economic life are the same throughout, but, whereas physical and climatic conditions alter very little during long historical periods, economic conditions may alter very quickly, and there is no type of region which is more liable to changes of character and outline than one which is based on economic conditions. The construction of a single line of railway or of a transcontinental canal may be sufficient to transfer the direction of economic development from one continent to another.

As a rule the determining factor is climate, which dominates the nature of the food-supplies, and thus stamps an area as a definite economic unit, but the stage of economic development that has been reached is also a powerful influ-

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ence in determining the boundaries of an economic region. Thus, in North-west Europe the utilization of mechanical inventions based on the production of power from coal has caused a rather ill-defined area to outstrip the rest of the continent in productive capacity. Lying between this definitely industrialized area and the Mediterranean and Russian regions are two areas where conditions are, on the whole,

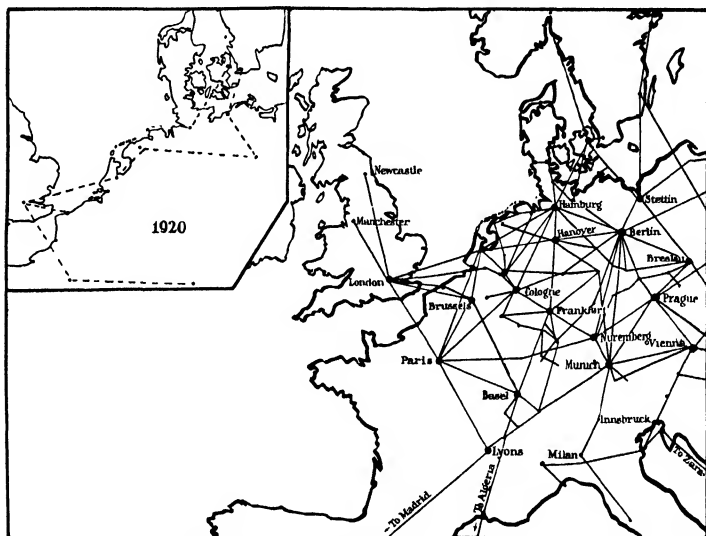


FIG. 8. EUROPEAN AIRWAYS IN 1920 AND IN 1930
For 1930 the principal towns are shown.

transitional between a high degree of industrialization, the small-scale intensive farming of Southern Europe, and the large-scale extensive farming of Eastern Europe. From the Pyrenees to Rumania there stretches a mass of high and mountainous country which has neither climatic nor physical uniformity, but which reveals a gradual transition between the industrialization of the West and the simpler methods of life in the East.

Between the Alps and the Baltic Sea a second loose unity may be noted in that the typical vegetation is forest, but

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here there are great differences between the economic character of the South German uplands and the plains of the north. The western part of the great European plain differs in physical structure, in climate, and in economic development from the eastern, and it is therefore a matter of great difficulty to determine to which economic region Poland belongs. Industrialized Prussian Poland and Upper Silesia have been yoked in nationality to an area which differs little in character from the undeveloped Russia. A similar problem presents itself when the southern, western, and eastern boundaries of mountainous Central Europe are under consideration.

In each case it is possible to represent Poland and Central Europe as transitional economic regions possessing an industrialized western portion, stretching from the Pyrenees through the uplands of South France, Switzerland, South Germany, the Italian Alps, Bohemia, Upper Silesia, and Austria, and an agricultural and pastoral eastern part, comprising the rest of Poland, Czecho-Slovakia, Hungary, Rumania, and the Balkan states.

The main consideration in determining the economic regions of Europe is therefore the stage of economic development reached in each area, though other considerations, such as the nature of the chief food-supplies and the natural and artificial communications, must also be considered.

1. North-west Europe. This area is the most industrialized region in the world, as regards both agriculture and manufactures. Unlike the other economic regions, it no longer maintains itself by self-supporting agriculture, though the bulk of its crops are consumed within the region. Industrial crops, such as flax and sugar-beet, are grown in preference to cereals in many districts because the former are more profitable under present conditions. Thus large areas of Britain which could produce cereals have been, or are being, converted to the cultivation of sugar-beet and fodder crops because it does not pay to grow foodstuffs in face of overseas competition.

There are smaller differences in the stage of development of the different parts of North-west Europe than in any other

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area in Eurasia. The races of North-west Europe do, it is true, exhibit small differences in development, but, on the whole, they have no marked contrasts of cultural level, such as are found in Central Europe and in Asia. More than one-tenth of the world's people live in North-west Europe, though the area occupied is less than one-fiftieth of the world's total area, even when the large areas of barren land in the Scandinavian peninsula and Finland are included within the region.

This great concentration of population, which reaches its most marked development in the triangle between Berlin, London, and Paris, is due to the general high standard of fertility, the abundant mineral wealth, and to the concentration of overseas and inland communications, which focus at the mouths of the Rhine-Scheldt, the Thames, and the Elbe. Here lie the principal railways, canals, and roads of Europe. At the chief towns there is a concentration of capital that, in normal circumstances, is free for the development of enterprises which will further increase the importance of the region. In brief, North-west Europe is the greatest commercial region in the world.

2. The Mediterranean Region. In the countries bordering the Mediterranean Sea there is a uniformity of climate which has given rise to a remarkable uniformity of products. Vine, olive, and wheat are found nearly everywhere, and most districts are self-supporting. Except in the uplands there is seldom sufficient grassland to make the rearing of cattle profitable, and the most remunerative occupation for many of the inhabitants is the cultivation of fruits and early vegetables for export to colder regions. Dairy produce is scarce, and olive oil is used as a substitute. The vine is still of importance. The absence of coal suitable for coking makes it unprofitable to develop metallurgical industries on a large scale, and the only large-scale manufactures are those carried on by means of hydro-electric power supplied from the Alps, Pyrenees, and Northern Apennines. More and more the Mediterranean region is tending to specialize in the production of relatively high-priced agricultural commodities, such as fruits and silk, for the markets of North-west Europe and the United States.

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One characteristic of the Mediterranean is the antiquity of its civilization, which has allowed sufficient time for certain racial types to fit themselves into the physical and climatic environments. The agriculture and mode of life of the people of the Mediterranean have been transplanted into the more recently discovered regions which possess similar physical and climatic conditions, but in the newer regions there is not the balance between local production and local consumption which is characteristic of the older Mediterranean countries, and the peoples which occupy such areas as Cape Colony and California have not yet attained the uniformity of culture which the Mediterranean reached centuries ago.

3. **Central Europe.** It has already been pointed out that 'Central Europe' is sometimes defined as being the region lying between the Alps and Scandinavia and sometimes as comprising the mountain area lying between the Mediterranean and the North of Europe. 'Central Europe,' as treated here, is assumed to consist of the Pyrenees, the central plateau of France, the Alps and the Po valley, the South German and Belgian uplands, Czecho-Slovakia, Austria, Switzerland, Hungary, Rumania, and the Balkan states, but in the regional treatment the outlying fragments, such as the Pyrenees, the central plateau of France, and the north of Italy, will be taken in their respective countries, which lie for the most part in other economic regions. As defined above Central Europe is a physical unit in so far as it consists of mountainous country deeply dissected by rivers. Its economic unity depends on forest and pastoral industries, and, from the Vosges and Jura in the west to the Balkans and Rhodope Mountains in the south-east, the combination of hill pastures with small-scale cultivation allows a rather scanty population to exist in moderate comfort. The population, however, is considerably greater than could exist on forestry and pastoral occupations alone, owing to the existence of extensive plains in Hungary and Rumania which produce vast quantities of cereals and encourage thereby the development of manufacturing industries in the upland areas. Many of these industries are based upon the extensive use of water-power.

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Central Europe also forms a transitional region between Northern and Southern Europe, and the control of north-south and east-west routes accounts for the development of many of the larger towns, which, but for their route-control, would be little better than local cattle and timber markets. The crops grown show the transition between the Mediterranean fruits of Dalmatia and the potatoes of the Baltic coasts. The timbers gradually change from the evergreen type of the Adriatic coast of the deciduous oaks and conifers of Northern Europe.

4. The Polish Transitional Region and the Baltic States. Eastward, away from the seaboard and the coalfields, economic development is less intense, lines of communication are fewer, and civilization is at a lower level. Poland is a buffer state created to form a barrier between the great military nations of the plain of Europe. Two centuries ago it was also a homogeneous economic region with a common nationality, but at the present time it is not an economic entity. The west of Poland is at about the same stage of economic development as Germany, of which West Prussia (Polish 'Poznań') was formerly the chief grain area. At the old Polish-German frontier a great change is apparent. Less careful methods of husbandry take the place of the typically German methods of the Poznań district, and the roads, railways, and navigable waterways are fewer in number and markedly less efficient than in former German territory. A large part of the population is still under arms. On the other hand, Poland is more industrialized than Russia, and has valuable mines and oil-wells in working order, and though external trade is chiefly the exchange of raw materials, such as coal and timber, for manufactured articles, the present tendency is toward incorporation in the industrialized region of North-west Europe rather than toward the development of large-scale wheat and lumber production, which characterizes the export industries of European Russia.

What is true of Poland is also true, to a less extent, of the Baltic states, though these can hardly be regarded as yet as independent economic units. It was through these states that Western influences penetrated into Russia, and

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their former importance was due to their control of the transit trade in Russian exports. There is little doubt that economic conditions will eventually compel these little buffer states to establish some sort of working agreement with Russia. They may even be reabsorbed in the Russian economic system while retaining their political independence. Their attempts to develop large numbers of small farms for the production of dairy produce on Western lines is evidence of their progressive outlook, but without the great Russian market it will be impossible for them to carry on their large-scale manufactures, which before the War were among the most important in the Russian Empire.

5. **Russia.** In the Mediterranean the scattered areas of fertile soil and of abundant water-supply limited both the type of agriculture practised and the number and size of the human settlements. In Russia the unreliability of the rainfall in many parts and the lack of easy transport over great distances have limited the agricultural production of the parts where rainfall is precarious or where the means of communication are bad to what is necessary for local consumption. Parts of European Russia have waterways and railways, which enable any agricultural surplus to be sold in the world-market, but it is still true for the greater part of Russia that production is largely limited to sustenance crops. In other words, Russia is a region at a much lower stage of economic development than the other parts of Europe.

The Russian region stretches from the Gulf of Finland to the uplands which lie to the east of Lake Baikal, and from the tundras of Northern Eurasia to the great belt of deserts which lies to the north of the great mountain chains of Central Asia. Within this area the superior stage of development of a relatively small part of European Russia has made it possible for the Government at Moscow (formerly for a time at Leningrad) to bring under its control the whole of the production of the greater part of Eastern Europe and Central and Western Asia. The communications centre on Moscow. If the railways are extended and retain Moscow as their node the many different regions contained within

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the boundaries of Russia will become welded into a strong economic region which could be entirely self-supporting.

POST-WAR PROBLEMS

Serious as was the widespread destruction which occurred in the war zones, and especially in Poland, the restoration of the devastated regions was the least important of the problems which Europe has had to face. On both land and sea the means of transport were speedily restored, the Rhine, Danube, and Oder were internationalized, the damaged towns of the war areas rebuilt, and new factories of modern type were constructed to take the place of those left derelict by the War.

The loss of human life, estimated at ten millions, was a much more serious problem, but in France, where the shortage of man-power was most acute, a great number of foreign workmen have come in, and have almost restored France's labour market. Many of the economic effects of the Peace Treaties, however, cannot have been foreseen. Thus the separation of the Ruhr coalfield from the Lorraine iron deposits intensified Franco-German rivalry, and led to a breakdown in the normal exchange of coke for iron ore, on which the industrial life of both nations depends. The making of new frontiers in Eastern Germany and the creation of the independent states of Danzig, Estonia, Latvia, Lithuania, and Hungary has brought into existence political and economic problems of a serious nature, but the most far-reaching of the changes in the European economic system is the social revolution in Eastern Europe. This has not been confined to Soviet Russia, for in a number of countries, extending from the Levant to the Baltic, the peasants who were formerly employed on large estates have become the owners or the tenants of small farms. This means that large-scale production has been partially abandoned throughout many parts of Eastern Europe in favour of the more intensive small-scale farming of the small-holder. The result is that agricultural exports from the Russian borderlands have decreased in amount, and there is a tendency for dairy products

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produced on co-operative lines to displace the older exports of timber and grain.

The financial position of Europe was weakened by the necessity of obtaining foreign loans for the purchase of essential raw materials and foods. This was the direct cause of the great depreciation of European currencies which took place some time after the War had ended, for whereas the financial position of such neutral states as Holland, Spain, and Sweden was materially improved, many of the belligerent nations were reduced to the verge of ruin. Many important industries were kept going by Government subsidies, and Italy saved her silk industry during the fluctuations of the lira by purchasing cocoons at a fixed price. In a similar manner Britain tried to bolster up the coal industry by direct subsidies.

The net effect is that Europe owes the United States a great debt which must be paid in goods. This should have the effect of stimulating European export industries, but there are too many tariff frontiers, and many countries still ignore the law of comparative costs and put down expensive plant for manufactures for which their resources are unsuited. At the present time there are still several countries which have hardly succeeded in stabilizing their currencies, so that they are no longer important markets. European markets are of vital importance to Britain, and though there is a tendency for Britain to develop her Imperial markets, and especially those of Australia and the Crown Colonies in Africa, many of her basic industries are depressed so that either the costs of production must be further reduced or there must be emigration on a large scale. Finally, the financial strength of the United States has led to the transfer of much of the world's financial business from London, Amsterdam, Paris, and Berlin to New York, and many of the great European industries are now directly financed by America.

The World War stimulated production, particularly in engineering, throughout Western Europe. Out-of-date processes and machinery were abandoned and methods of specialized and standardized mass production were adopted, with the result that Europe's manufacturing capacity was

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greatly increased. Unfortunately the output of primary products did not maintain the same rate of progress, and the high prices of imported foodstuffs and raw materials made it impossible for European countries to carry on their industries on a sufficiently large scale to be profitable. At the present time it is possible to distinguish two great economic regions in Europe, an industrial area in the west and an agricultural area elsewhere. The first is densely populated, highly specialized, and lives to a considerable degree by exchanging its manufactures for raw materials and foods produced elsewhere. In the west a knowledge of three languages enables one to converse with 160,000,000 people, whereas in the other parts twenty languages are needed to converse with a similar number of people. In the region which lies outside the industrial zone Europe is both under-populated and under-developed, but in the west over-production has led to glutted markets, and, as business organization and machinery become more efficient, new markets must be found if the enormous army of workless people is to be reduced. Several economists have suggested that if agricultural Europe could be organized, and while remaining agricultural be made more efficiently productive and brought up to the level of Western Europe in its wants and financial resources, it would form the new market which is so badly needed. Several measures have been suggested, ranging from a reduction of national tariffs by agreement to a customs union of the states of Europe, with the ultimate possibility of forming a United States of Europe.

CHAPTER II

NORTH-WESTERN EUROPE: GENERAL GEOGRAPHY

SURFACE FEATURES

NORTH-WESTERN EUROPE is characterized by a great variety of rocks and surface soils, derived from every epoch in the world's geological history. In the north-west there occur fragments of Archæan age, remnants of a great land area which formerly extended from the west of Ireland through the Highlands of Scotland to Scandinavia and Spitsbergen. Barren and almost devoid of useful minerals, these north-west highlands have perhaps their greatest economic development in the Scottish Highlands, where they are now used as preserves for game-birds and deer. Conditions of life are everywhere so difficult that there is a constant stream of emigration from both Scandinavia and Scotland.

To the south and south-east of the highland area the surface is one of low relief, forming the western half of the great European plain. In many parts this plain is uniform, but in past geological ages elevation, folding, and subsequent erosion have given to the area a great complexity of structure, which can be judged in quarries, cuttings, and borings which have been made in many districts. As an example of this great variety of structure, it might be noted that within a twenty-five-mile radius of Shrewsbury it is possible to find at the surface samples of rocks varying in age from the Archæan ridge of the Longmynd to the Liassic and Quaternary deposits of the Wem district. Even in South-east England well-borings pass rapidly through Tertiary deposits and the chalk, where artesian water is stored, and may even penetrate on occasions into rocks of Primary age. As a result the surface soils of the western parts of the European plain show a great variety, even though areas of ground moraine have some appearance of uniformity. The only homogeneous soils are the deposits of recent alluvium in lake-beds,

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river valleys, and deltas. Though the farms on the alluvium may have a large part of their acreage under cereals the one-crop system of agriculture is seldom practised, because of the need for allowing the soil to recover. The varied nature of the surface soils has given rise to the system of mixed farming which is characteristic of North-west Europe. On the south of the European plain older rocks appear at the surface, and these form an intermediate zone between the plain and the Central European highlands. It is in this foothill zone that the most important deposits of iron and coal are found, and these form the basis of the industrial life of the greater part of North-west Europe.

CLIMATES

In North-west Europe rain occurs at all seasons, and though the period of maximum precipitation varies in different localities the rainfall is generally distributed evenly over the surface and regularly throughout the year. The annual range of temperature is small, and increases toward the east. In the south-west of Ireland the range between the coldest and warmest months is less than 15° F.; in the Thames valley the range is about 25° F.; in the east of France, Belgium, Holland, and Denmark, and in the west of Germany, it is about 30° F.; and in the east of Germany about 35° F.

On the west coast there are frequently great changes of temperature during the course of a few hours. Within a single day the changes experienced may be as much as the difference between the average temperatures of the hottest and the coldest months. This short-period fluctuation is particularly important in the early months of the year, when cyclones or depressions of more than ordinary intensity move along the coasts of North-west Europe. In fact, the coastal regions depend for their climate on the air currents which accompany the passage of the depressions. It sometimes happens that there is frost at Biarritz when it is quite warm at Bodö, which lies just within the Arctic Circle.

It is this 'unreliability' of temperature which limits the agricultural productions of the coasts, and especially the

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spring crops, to hardy plants which can resist rapid changes of temperature, and militates against cereals that require long periods of summer sunshine for ripening. The absence of protracted frosts distinguishes the north-west from all other areas which lie within the same zone of latitude (40° – 60° N.). This is a great advantage, as it enables work to be carried on out of doors throughout the greater part of the year. Moreover, the passage of warm salt water from the Atlantic into the North Sea keeps the ports free from ice in winter and allows external commerce to be carried on continuously. It should be noted, however, that where estuaries are fed by ice-cold rivers coming from Central and Eastern Europe, and especially in the almost fresh Baltic Sea, there is a danger of freezing. Thus, even Hamburg maintains a service of ice-breakers, while Lübeck is icebound for thirty-two days, Swinemünde for twenty days, Stettin for sixty-one days, and the inner harbour of Memel for a hundred and forty-two days each year. The Rhine is icebound at Cologne for twenty-one days, and navigation between Mannheim and Rotterdam is rendered difficult during average winters. The Saône is frozen for fifteen days, and the Oder for more than two months.

It is possible to distinguish three climatic sub-regions in North-west Europe.

1. The **oceanic region** is influenced throughout the year by its nearness to the Atlantic Ocean, and is characterized by its equable temperature and its autumn and winter maximum of rainfall. Its frequent changes of temperature have already been noted, and it should be remembered that it has a high rainfall, with cloud covering, on an average, 80 per cent. of the sky. Though its summer temperatures are generally high enough for the growth of wheat, its summer rainfall is frequently too great, and though the rainfall is sufficient for maize the summer temperature is too low for it to ripen, except in the south-west of France. It is clear, therefore, that the best use which can be made of the land is the cultivation of pasture grasses and cereals, which prefer a lower temperature and less sunshine than wheat. Consequently oats and roots are important crops, and though some use

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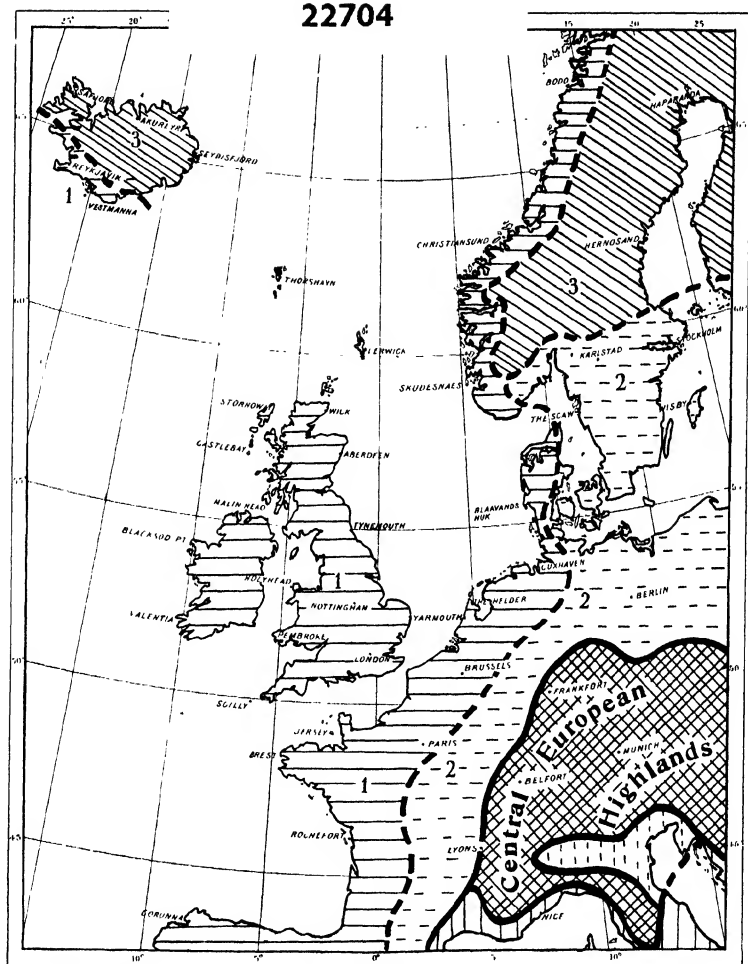


FIG. 9. CLIMATIC SUB-REGIONS OF NORTH-WEST EUROPE

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can be made of these as human food their principal value is for the maintenance of large numbers of cattle, and especially of dairy cattle.

2. The **semi-continental region** comprises the greater part of Germany and parts of Southern Scandinavia and Eastern France. Here the bulk of the rain falls in the summer months, and there are smaller fluctuations of diurnal temperature. There is a general absence of cloud and rain in autumn. This allows the vine to ripen, and the general warmth of summer is sufficient for the growth of cereals on a larger scale than is possible on the coasts. In winter abundant falls of snow protect the winter grain from the effect of the frosts, which often last for two or three months.

3. The **uplands of Scandinavia and Iceland** are high plateaux whose general elevation (above 3000 feet) causes them to be much colder at all times than the regions nearer sea-level. At all times, but especially in winter, the Scandinavian and Icelandic plateaux are subject to strong winds, which render tree growth impossible and limit the vegetation to plants which resemble those of the tundra or the Alps. These high moors sometimes serve as summer pastures, particularly for sheep. Snow falls at most seasons, and in Scandinavia forms a reserve supply of water, so that water-power may be obtained even during the drier summer months.

FERTILITY

A very large proportion of North-west Europe is capable of producing foodstuffs, ranging from rye to maize, meat, and dairy products, and raw materials of industry, such as timber and flax. The existence of fertile soils, relatively dense population, and easy communications has made this one of the most important agricultural regions in the world, but the lack of food export masks this importance in the returns of international trade. Agriculture varies in character in the different parts of the region, but there is no attempt to make the region self-supporting in food because of the ease with which foodstuffs and raw materials can be obtained in return for exported manufactures.

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SOURCES OF MECHANICAL POWER

The chief sources of mechanical power are coal, water-power, and mineral oil. Of these the coal is the most important and the mineral oil the least important in Europe. Before the World War Europe produced more than half the world's output of coal, and in 1929 nearly 47 per cent. of the coal raised was mined in Europe. Britain, with 32 per cent. of the total coal reserves of Europe, is capable of producing 290,000,000 tons per annum. Germany, which still owns about 29 per cent. of the reserve, produced in 1926 about 163,000,000 tons of coal and 174,000,000 tons of lignite, the equivalent of 44,000,000 tons of coal. With the exception of Poland, which now owns more than 13 per cent. of the reserves, and with the possible exception of Czecho-Slovakia, which owns about 5 per cent. of the reserves, the other European countries do not produce sufficient coal for their domestic requirements. There are therefore within the European boundaries all the conditions for an important international trade in coal.

Both Britain and Germany have a considerable surplus of many different kinds of coal within a short distance of navigable waterways or of sea-coasts. Both these countries have a supply of skilled miners, and both are deficient in bulky raw materials which can be used as return cargoes. Britain has a large number of specially constructed cargo steamers, while Germany has a large number of 1200-ton barges for use on the Rhine and other inland waterways. Coal-marketing conditions have altered since the War chiefly because of currency fluctuations, which have increased the pithead prices in some countries and lowered them in others. Freight charges have fluctuated, and the spheres of export have been changed by the increased development of other sources of power.

The exporting capacity of Britain is definitely less than it was in 1913. Being dependent on its foreign markets, the British coal-export trade was entirely disorganized by the War, when it was necessary to restrict exports in order to conserve the coal for our essential needs. Export prices rose

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to tremendous heights, markets were lost, and a sharp stimulus given to the development of foreign coalfields and of alternative sources of power. Since the War both production and exports have recovered in a really remarkable manner, but this has been due chiefly to a series of accidents. Until 1921 the British coal industry was busy replenishing Continental stocks. In 1922 the post-War depression was warded off by the great coal strike in the United States. In 1923 the occupation of the Ruhr by the French made Britain the sole source of European supplies. This came to an end in 1924, and the British coal-export industry had to face more normal post-War conditions. In 1924 coal production and export reached pre-War levels, but in 1925 it became obvious that the export market was definitely less than in 1913.

In Germany and Russia the consumption of coal is markedly less than before the War, but in Germany this is due less to the loss of territory than to the development of lignite and water-power. In Russia the cause is partly the loss of purchasing capacity and partly the internal dislocation of economic life. In Italy German coal has displaced British coal. Reparations to France, our chief customer, also take the form of coal. Moreover, the French mines have been re-equipped on modern lines, and the whole of the output of the Saar and Lorraine coalfields has been added to France's resources, while large hydro-electric power schemes have been carried out and form an important alternative source of energy. Spain and Holland have increased the output of their coal-mines, and require less coal from Britain and Germany.

Before the War Britain supplied two-thirds of the coal exported to the deficit countries of Europe and Germany supplied the remaining third, chiefly to Central Europe. Since the War Germany has been compelled to supply reparations in the form of coal, and these deliveries have now reached about 14,000,000 tons per annum. They have been directed to markets in France and Italy, which were almost exclusively supplied by Britain in 1913, and there remain about 7,000,000 tons which Germany is able to export to Holland, Belgium, Czecho-Slovakia, Sweden, Switzerland, Austria, and Algeria.

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Poland now owns the greater part of the Upper Silesian coalfield, and produces about 40,000,000 tons per annum. No less than 40 per cent. of this is exportable because of the great use which is made of lignite and timber as fuel. During the coal stoppage in Britain in 1926 Poland was able to secure a foothold in the markets of Baltic countries which had previously been monopolized by British collieries. Before the War the greater part of the output of the Upper Silesian

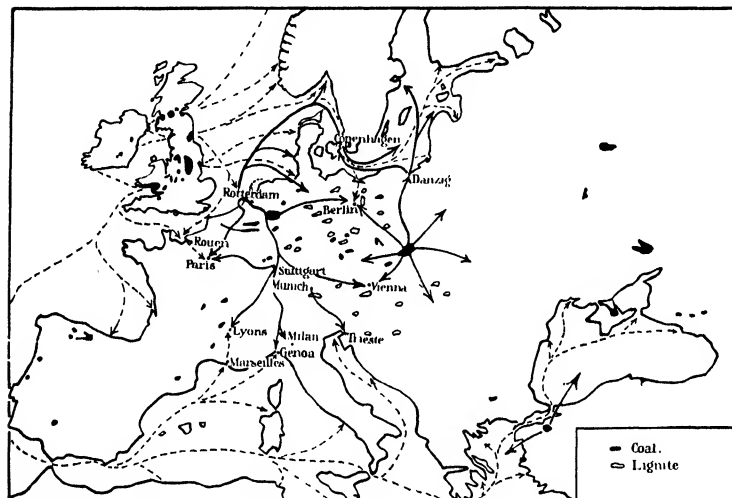


FIG. 10. THE COALFIELDS AND COAL EXPORT TRADE OF EUROPE

collieries had been marketed in Germany, but during 1925 the Germans refused to allow the Oder valley to be used for the export of Polish coal, and the inadequate equipment of the Polish shipping trade hindered the expansion of Poland's overseas exports. Large quantities are sent overland to the succession states of Austria-Hungary, and quantities of Polish coal find their way into Denmark, France, and even into Britain.

Estimates of the total amount of water-power available in Europe vary between 45,000,000 and 90,000,000 horse-power—*i.e.*, between 10 per cent. and 50 per cent. of the world's reserves. It is obvious therefore that there is little

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value in such estimates, and that the serious student must confine his attention largely to the actual power developed. However, in most of the countries of North-west and Central Europe the estimates are fairly accurate, except in the British Isles, where the estimates would suggest that nearly 90 per cent. of the power available had already been harnessed, which is obviously not true. The figures which have been adopted in this chapter are those published in connexion with the World Power Conference of 1924.

According to these returns there are two great water-power regions, the north-western highlands of Europe and the Central European highlands, including Spain and the Apennines. The total power available is about 34,000,000 horse-power, and about one-third of this has been developed since 1910. North-west Europe has about 25,000,000 horse-power, and though a large part of this lies in rather inaccessible parts of the Scandinavian and Icelandic plateaux, it is in Norway and Sweden that the greatest developments have taken place, Sweden producing about 1,400,000 and Norway 1,300,000 horse-power. Smaller amounts are generated in Finland, Estonia, the Baltic ridge of Poland and Germany, and in North Wales, the Scottish Highlands, and the Shannon basin. The total amount of hydro-electric power generated north of the Central European highlands is about 3,000,000 horse-power, which is only a small part of the power derived from coal and lignite within the same area.

Central Europe is singularly lacking in coal, and has developed more than 8,000,000 horse-power, chiefly in France, Italy, Switzerland, Spain, and South Germany, each of which countries has developed more than 1,000,000 horse-power. Each of the other Central European countries produces less than half a million horse-power, and has not as yet developed wholesale schemes of electrification.

The two water-power regions differ in several ways. In North-west Europe the regions where water-power is abundant are far from the main routes and the local population is scanty. The power developed is used chiefly in electro-metallurgical, electro-chemical, and timber industries. In the Central European highlands and in South Germany and

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France the population is dense, so that the power finds a ready market in lighting and traction and in general manufacturing, with the result that the manufacturing capacity of France, Italy, and North Spain has been almost doubled since the outbreak of the World War. The balance of strength which was once in the hands of countries rich in coal and other fuels is becoming more evenly distributed, and an international levelling up of production and consumption is gradually being realized. There are many advantages in the development of electrical power on a large scale. Coal is saved, smoke is eliminated, power and railway transport are cheapened, and rural industries are fostered, but it is probable that the social advantages outweigh more material considerations, and the decentralization of industry enables the congestion of work-people in slum districts on the coalfields to be relieved.

There are few problems confronting Britain and the other countries of North-west Europe which rely on the direct consumption of coal for their industrial power that cannot be studied in the light of the experience of those areas where hydro-electric industries have been established on a national scale.

Petroleum is the third most important source of mechanical power, though its use is practically confined to facilitating transport. The reserves of mineral oil in Europe are relatively small. The most important deposits are in the south-east of Russia, in the neighbourhood of the Caspian Sea, a district which produces more than half the European output. Most of the oil in Europe occurs in highly disturbed Tertiary formations, and the beds generally offer considerable difficulty in drilling. Although the initial yield is high the wells soon begin to decline in importance. As late as 1901 the Russian oilfields furnished more than half the world's supply of mineral oil, the chief centres being those of the Baku, Grozny, Maikop, Emba, and Cheleken districts.

The Polish and Rumanian oilfields lie in a narrow belt which follows the foothills of the Carpathians. The chief Rumanian oil-wells are at Prahova, Buzeu, and Bacau, but the presence of oil is suspected in the Bukowina and in

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Hungary. The Polish oil-wells are in the neighborhood of Stanisławow, Schodnica, and Boryslaw. With the exception of the Russian fields the oil-wells of Europe contribute little to the requirements of Western Europe. There are considerable deposits of petroleum in Hanover, Alsace, and the Apennines, and practically the whole of the supplies needed for motor transport are imported from America, Asia, and Russia. Oil-shales are widely distributed, and may prove of value when the supplies of liquid oil are exhausted. The only European countries which have oil-shale industries are Scotland, France (Autun and Aumance), and Estonia.

MINERALS

In 1913 Europe produced nearly 60 per cent. of the world's output of iron ore, and the world's best ores are still obtained from the older rocks of North-west Europe, which has about one-quarter of the world's known reserves (*cf.* U.S.A. 20 per cent., Cuba 10 per cent., and Newfoundland 11 per cent.). It is possible that North-west Europe is still potentially the greatest iron-producing region in the world. Prior to 1914 it produced more than half the world's output of iron and steel, but since 1918 political and financial crises have hindered the recovery of Europe's iron industries. It should be noted, however, that North-west Europe has increased its share of the world's output of iron and steel from 33 per cent. in 1923 to about 45 per cent. in 1925, while that of the whole of the United States declined in the same period from 65 per cent. to 54 per cent. The European iron industries are not so highly localized as those of the United States.

The world's largest known deposits of manganese ores, producing more than half of the world's pre-War output, are situated on the southern slopes of the Caucasus, but because of the War, which cut off Russian supplies, new fields were opened up in India, Brazil, and the Gold Coast, and the countries of Western Europe no longer monopolize the bulk of the world's production. Raw materials for the chemical, pottery, and glass industries are also found near coal in many parts of Western Europe, and the wide distribution of many

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metallic minerals, such as copper, lead, silver, tin, and zinc, which have been worked for many centuries, has given rise in many districts to skill in workmanship, and the traditional skill so acquired has been the chief reason for the high degree of specialization in certain manufacturing industries. The age of light metallic alloys has dawned, and non-ferrous metals have become important in modern industry because of the development of high-speed motor and structural engineering, the introduction of electricity into power generation and domestic appliances, the expansion of the aeroplane and motor industries, and the great development of printing and photography. Standardization on a basis of chemical purity is almost complete, so that international trade in non-ferrous metals no longer requires the services of local *entrepôt* experts, and stocks depend entirely on price levels.

There are only two non-ferrous metals, zinc and aluminium, of which Europe possesses important supplies, and as the main centre of production is America the non-ferrous metal industries of Europe are largely dominated by American conditions. The main industrial states of Europe have become importers of metals on a vast scale. Gold-mining, which was formerly carried on in a few places in France and Northern Italy, is no longer important, except in the Urals, which are also important for platinum. Copper-mining is confined to four districts—the Rio Tinto area, in Portugal; Bor, in Yugo-Slavia; Mansfeld, in Germany; and the Kedabek-Aangezur district of the Caucasus. The close of the World War lessened the demand for lead, and the depreciation of the value of silver led to the decline of lead-silver mining, which is normally carried on in South-east Spain, Upper Silesia, the Laurium district of Greece, the Harz, and Styria.

Tungsten is being increasingly used in the steel industries, but the only important European deposits are in Portugal, though parts of Spain, France, Cornwall, and the Erzgebirge produce small quantities. Arsenic is still important in France, Upper Silesia, Cornwall, and Portugal; mercury in Almaden, in Spain, Mont Amiata, in Italy, at Zips, in Hungary, and in Idria; and France still produces considerable amounts of antimony in Mayenne and in the central

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plateau. Nevertheless, in the case of most of the non-ferrous metals Europe is dependent for the bulk of its supplies on other continents.

The chief European zinc-mines are situated in Upper Silesia and South-west Poland, at Iglesias in Sardinia, in Murcia and Santander in Spain, at Laurium in Greece, at Ammeberg in Central Sweden, and in the borderland of Belgium and Germany, near Stolberg and Moresnet. The chief bauxite-mines, used in the extraction of aluminium, are in South-east France, which produced nearly 60 per cent. of the world's supplies in 1913. The chief graphite-mines are in Bohemia, Moravia, and Styria, though there are considerable deposits in North-west Italy, in the Maritime Alps.

Sulphur is being increasingly used in the manufacture of chemicals, and is chiefly obtained from the pyrites-mines of Norway, Sweden, and Spain and from the plateau regions of France and Central Germany, the Khalkidike peninsula, and Tuscany. Native sulphur is collected near Etna and Vesuvius.

With the exception of potash, European deposits of mineral fertilizers are largely worked out, and supplies of phosphate are obtained either in the form of basic slag from the steel-works or from the mines of Tunis and Algeria. The world's chief potash deposits, however, are situated in Central Germany and in Alsace, and there is an abundance of common salt, more than half the world's output being obtained from Britain, France, Germany, and Russia. These deposits make it possible for Europe to develop large-scale chemical industries.

INDUSTRIAL CONDITIONS

With the exception of the Far East, North-west Europe is the most densely populated part of the world, with about 210 persons per square mile, and this in spite of the fact that in Scandinavia and Finland the greater part of the surface consists of infertile highlands. It should be noted that India has only about 175 people per square mile, and it is therefore obvious that, as a reservoir of labour, North-west Europe is almost as important in point of numbers as the more

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densely populated regions of Asia. Moreover, it has an advantage over the Far East in that its people are living at a much higher stage of economic development. The racial character of North-west Europe is very mixed, but there are relatively slight differences in the high cultural level of its various peoples. There are fewer languages than in most regions of equal area, and the ease of communications by sea, river, rail, and road is important in giving rise to stable Governments and a high standard of education. The active mingling of races has played a part in the growth of civilization.

With the discovery of the sea-routes to Asia and America the oceanic site of North-west Europe has steadily appreciated in importance, and since the end of the sixteenth century, when the Dutch and British wrested the command of the sea approaches of the Continent from Spain and Portugal, the position of North-west Europe as the geographical centre of the land-surface of the world has led to the development of a number of world-*entrepôts*.

Backed by the best system of inland communications in the world, and with the tides to facilitate inland navigation, North-west Europe has created a greater number of world-ports than any other economic region.

In 1929 the principal ports of the world, according to tonnage entered and cleared, were London 57,578,000, New York 48,830,000, Antwerp 48,546,000, Singapore 45,434,000, Hamburg 44,100,000, Rotterdam 41,991,000, Hong-Kong 39,871,000, Shanghai 35,870,000, Kobe 32,000,000, and Liverpool 28,983,000. These figures are evidence that North-west Europe is the great commercial centre of the world.

The long period during which manufacturing industries and commerce have been carried on has given an accumulation of capital which has enabled the financiers of North-west Europe to control a large share of the production of raw materials and foodstuffs outside that region, to control the shipping which carries raw materials to the place of manufacture and the finished products to their markets, as well as to control the actual manufacturing operations.

CHAPTER III

FRANCE : GENERAL CONSIDERATIONS

FRANCE comprises several distinct physical regions, but has characteristics as a whole which distinguish it from other political areas. The diversity of its physical structure gives rise to an alternation of good and bad soils, of mountain pastures and arable plains. The resources of the various areas are complementary, and this condition has led to a close interrelation which cements the various parts and makes France an almost independent economic unit. Vidal de la Blache states that "France is a land which seems to have been designed to accommodate, to a great extent, its own emigration." The different physical regions are so situated as to be mutually interdependent. Men living in the poorer districts of heath, permanent pasture, and forest can generally find within a short distance of their homes good agricultural land, where they can obtain temporary employment during the sowing and harvest seasons. These seasonal emigrants return to their home districts after the busy seasons, with the result that economic life tends to be localized in small towns and villages. There are few areas of great urban concentration, such as are to be found in the industrial districts of Northern England, but, on the other hand, the industrial and commercial centres of France are not so far apart as those of the eastern countries of the great European plain.

France has no natural frontiers which entirely exclude foreign influences. Even through the Pyrenees and the Alps there has always been contact with South and the East, while on the north and north-east outside influences have always been at work in moulding the economic and political conditions of the greater part of the country included within the present frontiers. In fact, it is in a large measure owing to the pressure of the surrounding regions that France has attained to her strong national unity. Above all, France is

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the country where the principal routes of the European plain, the Mediterranean, and the Atlantic Ocean converge. To her

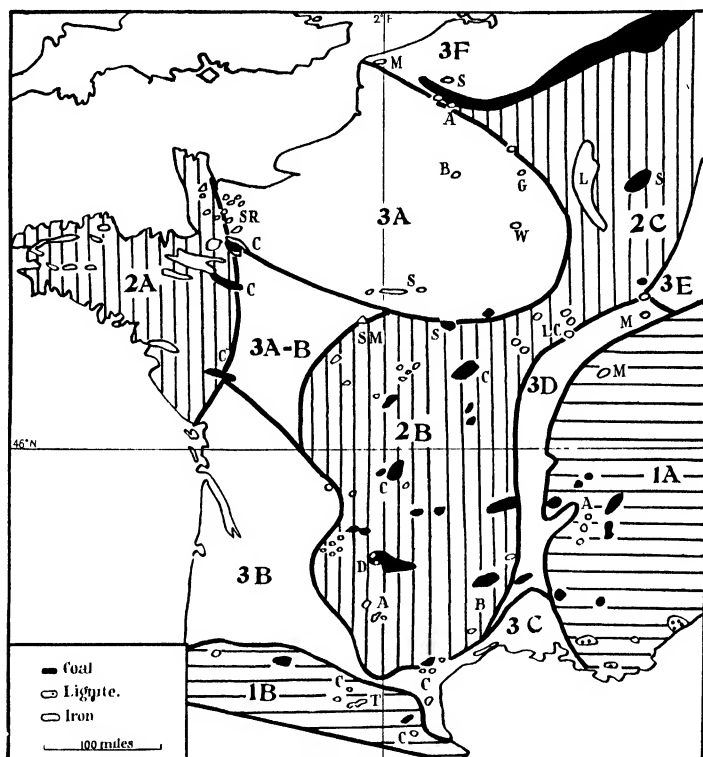


FIG. II. PHYSICAL REGIONS OF FRANCE

1. **Fold Mountains:** **A**, the Alps (A, Alleuard; M, Metabier); **B**, the Pyrenees (C, Castres, Canigou; T, Tarascon).
2. **Primary Uplands:** **A**, *Armorica* (C, Chantonnyay); **B**, the central plateau (B, Besseges; C, Champagnac, Chamond; D, Decazeville; LC, Le Creusot; S, Saincaize; SM, Saint-Martin); **C**, the north-eastern uplands (L, Lorraine ironfield; S, Saar coalfield).
3. **Lowlands:** **A**, *Paris basin* (A, Anzin; B, Blanzay; C, Chateaubriand; G, Grand-pré; SR, Saint-Rémy; S, Sancerre; W, Wassy); **A-B**, the *Portou gate* (C, Chalonnnes); **B**, *Aquitaine*; **C**, the *Rhone delta* (C, Corbières); **D**, *Rhone-Saone valley* (M, Montbeliard); **E**, the *Rhine Rift Valley*; **F**, *Flanders* (M, Marquise; S, Sainghim).

long-established contact with the Mediterranean world France owes her language and the most characteristic elements of

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her civilization. It was from the Mediterranean that such economic plants as the vine, barley, and wheat were obtained, while her cities, especially in the south, are based the Roman model.

PHYSICAL REGIONS

1. *Fold Mountains.* The Alps, Jura, and Pyrenees form three mountain chains which separate Italy, Switzerland, and Spain from France. They are naturally regions of pasture and forest, while to the manufactures which are usually found in mountainous regions there have recently been added electro-chemical and electro-metallurgical industries based upon hydro-electric power.

2. *Primary Highlands.* In the Armorican peninsula, the central plateau, Morvan, the Côte d'Or, the Vosges, and the Ardennes the relief is less marked than in the folded chains. Except in the neighbourhood of volcanic rocks, which weather into rich soils, the highlands are moor and forest regions, which can never be more than pastoral districts with local timber industries. Here and there, however, in basins lying either within or on the edges of the plateaux, rich coalfields have persisted, with the result that small but highly industrialized communities find a living in specialized manufacturing.

3. *Lowland Basins.* The principal basins are those of Flanders, Paris, and Aquitaine, with the valley of the Rhône-Saône and the plains of the Midi and Alsace. Generally the lowlands consist of alternating outcrops of rich and infertile soils whose variety gives rise to a great diversity of products which find an outlet in the well-distributed market towns of the river valleys. Between the lowland regions there are a number of easy passes by which communications are maintained. The Poitou gate links the basins of Paris and Aquitaine, while the Lauraguais or Naurouse gap preserves contact between the plains of Midi and Aquitaine. The "Passages de Bourgogne," near Dijon, connect the Saône valley with the Paris basin, and the "Trouée de Belfort" (Burgundian gate) is a narrow gap which forms the principal

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route between Burgundy and the upper Rhine. Farther north the Zabern gap (Col de Saverne) links Alsace with Lorraine. In the extreme north the plains of Belgium are merely a continuation of French Flanders, and afford the easiest lowland route into France. In the extreme south communications with Spain are restricted to the coastal districts and to such narrow passes as the Col de Perthus and Col de la Perche, which carry roads across the Spanish border.

CLIMATIC REGIONS

On the whole France is typical of North-west Europe in that its rainfall is more or less uniformly distributed throughout the year, while its temperature conditions are free from extremes of both heat and cold. On the other hand, it must not be assumed that France lies entirely within one of the great climatic regions, as there are very considerable areas which in climate resemble Central Europe and the Mediterranean, rather than the countries of the North Sea. Relief plays an important part in determining the local climates of France, and especially so in the east, where the altitudes are highest. Here there are three distinct climatic zones—the Alps; the Rhône and Rhine valleys; and the central and north-eastern plateaux. At the mouth of the Rhône lies an area which belongs to the Mediterranean region, while on the south the Pyrenees repeat in a modified form the climatic peculiarities of the Alps. The western half of France has a definitely North-west European type of climate, though even here there are considerable differences both in the seasonal distribution of rainfall and in the temperature conditions. It is obvious, therefore, that France is a country which offers scope for a variety of cultivated plants ranging from root crops and pasture grasses in the north to olives in the extreme south.

Climatic Sub-regions

I. *Alpine Region.* The most characteristic features of Alpine regions are the daily extremes of temperature even in the summer months. This effectively limits their vegeta-

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tion to those plants which are not affected by a rapid fall of temperature after sunset. Thus, though the average summer temperature is often high enough and the rainfall sufficiently abundant for the growth of maize, the low night temperatures make its ripening impossible in most localities.

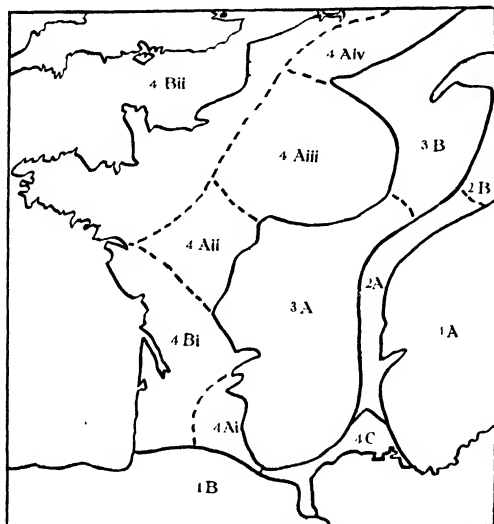


FIG. 12. CLIMATIC SUB-REGIONS OF FRANCE

1A, Alps; 1B, Pyrenees; 2A, Rhône; 2B, Rhine; 3A, central plateau; 3B, north-east plateau; 4Ai, upper Garonne; 4Aii, Loire basin; 4Aiii, Paris basin; 4Aiv, Flanders; 4Bi, Biscayan coast; 4Bii, Channel coast-lands; 4Biii, Paris basin; 4Biv, Flanders; 4Bu, Biscayan coast; 4C, Mediterranean coast.

The clear atmosphere and sunshine of the Alps and Pyrenees encourage the growth of mountain health resorts, and the abundant snowfall causes spring floods, which may be ponded in reservoirs for the development of hydro-electric power. Forests and pastures, however, determine the principal human activities, though the seasonal snowfall limits the usefulness of the high pastures, which can provide fodder only toward the end of the summer. As a result transhumance is often practised in both the Alps and the Pyrenees.

FRANCE: GENERAL CONSIDERATIONS

2. *The Rhône and Rhine Valleys.* Between the Alpine region and the plateaux which stretch from the south of France to the Ardennes lie two deep and rather narrow valleys which have much milder conditions. Throughout the Alpine zone the rainfall is generally more than sixty inches per annum, but in the great depressions of the Rhône-Saône and Rhine the rainfall seldom exceeds thirty inches. Moreover, it is not distributed evenly throughout the year, but varies between the winter maximum of the Rhône valley and the summer maximum of the Rhine valley. Two sub-regions may be distinguished—the Rhône-Saône valley (2A) and the Rhine trench (2B). The former exhibits a gradual transition between Mediterranean conditions and those of Central Europe, and there is a finely graded transition in the cultivated crops, from the olive, which disappears near Montélimar, the mulberry, which loses its importance between Lyons and Mâcon, to the maize and sugar-beet of Burgundy and the potatoes and oats of the Rhine Rift Valley. The Rhine Rift Valley is definitely continental in character, and has about three months of frost in winter, whereas the Rhône-Saône area has less than sixty days of frost during the year. The vine is still grown in the north, but the stumps are cut down at the end of the harvest. The Rhine valley is very near the northern limit of the vine, and the only reason why this crop is important is that the Vosges offer shelter from the rain-bearing winds, which bring cloudy conditions to the north-west of France in the early autumn. Cereals become increasingly important in the north, though wheat replaces the maize which is characteristic of the Saône basin.

3. *The Plateau Regions of France.* Except on the south-east slopes which face the Mediterranean the central plateau (3A) has a somewhat severe climate, with a long, snowy winter and more than three months of frost. This limits the plant life to the hardier types of trees, and in higher parts these are replaced by moorlands and even by bare rocks. Poor pastures characterize great stretches of the plateaux, the drier limestone areas supporting sheep and the damper and milder western slopes, which consist of volcanic soils, cattle. Throughout the rainfall is more than thirty inches,

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but it is only in the more elevated districts that it exceeds sixty inches per annum. The north-eastern plateaux of Langres and Lorraine (3B) lie at a somewhat lower elevation than the central plateau, but they are farther north and more subject to the cold north-easterly winds of Central Europe in winter. The Vosges and Lorraine region is definitely continental, with an annual rainfall which in places amounts to sixty inches or more. The rain falls chiefly in summer storms of relatively short duration, and there is a great deal of sunshine. The winter snows melt rapidly in spring, and cause floods both in the Paris and in the Rhine basins.

The forests of the central plateau are largely composed of chestnut-trees, which supply food for both man and beast. The Vosges are clothed with conifers, and there is a smaller supply of fodder except in the Lorraine plateau. Stock-rearing and forest industries are general, but the vine is less important, except in the sheltered Moselle valley. In the extreme north the Ardennes consists largely of moorland, which supplies food for the hardy Ardennes cattle and horses, and the timber is confined to the deeply entrenched slopes of the river valleys. On the whole one may consider the plateaux of France as the western margins of the highlands of Central Europe, and therefore of similar difficulty, the inhabitants being compelled to supplement their natural resources by the development of manufacturing industries. The water-power of these regions is considerable, and textile industries are widespread.

4. *The Lowlands and Coastal Districts of France.* The west of France consists of a region of low relief, with well-distributed rainfall which is everywhere sufficient for cultivation, though it seldom exceeds sixty inches in the year. The greater part of the area has less than two months when frost occurs, and the western coastal districts are practically frost-free. The western lowlands have a definitely North-west European type of climate, with open winters during which agricultural operations can be carried on. The Mediterranean coast (4C), on the other hand, is equally definitely a region of autumn and winter rain, with the char-

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acteristic Mediterranean crops—the olive, vine, and citrus fruits. The woodlands have deteriorated into garigue, as in other parts of the Mediterranean region. The warm, genial winter conditions make the eastern part of the coast of Provence one of the most frequented winter resorts of the continent of Europe, though the west part, which includes the delta of the Rhône and the Midi plain, often experiences the cold mistral winds.

The upper Garonne (4Ai) is a transitional region between Mediterranean and North-west European climates. It is drier than the coast-lands of the Bay of Biscay, but not as dry as the Midi plain and the mouth of the Rhône. As one goes from Narbonne toward the Garonne the rainfall gradually increases, and the olive ceases to be important before Carcassonne is reached. Maize finally replaces wheat as the principal grain near Toulouse, though wheat remains important through the upper Garonne.

The Biscayan coast (4Bi) is characterized by high summer temperatures (over 70° F. in July) and abundant rainfall. On the whole it is too wet for wheat (more than thirty inches of rain per annum), and a considerable proportion of the land is under maize or permanent grass. In several areas the soil consists of limestone, which makes the ground dry enough for vine culture. In the damper parts there are forests of oak, while in the swampy Landes there are large forests of pines, which are gradually converting the swamps into fine cattle pastures. As this region is practically free from frost winter vegetables are important, especially in the north, toward Nantes.

The Loire basin (4Aii) has a climate which is intermediate in character between the moist coast of the Bay of Biscay and the relatively dry Paris basin. The annual rainfall is generally less than thirty inches, and occurs principally in autumn. The hilly districts are well wooded, while the lower parts are characterized by cattle pastures and orchards. The vine, however, is still found, and early vegetables are grown along the lower courses of the rivers. Wheat, oats, and barley become increasingly important as one goes from Bordeaux toward Touraine and Orléans.

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The Paris basin (4Aiii) is one of the two driest regions in France, with an annual rainfall which averages less than twenty-five inches. The climate is somewhat more extreme than that of the coastal districts, but as the average temperature for January is above freezing-point a good deal of work can be done in the fields during winter. The dryness, however, limits agricultural production in the parts which lie outside the river alluvium to crops which do not require an excessive rainfall. In consequence wheat, barley, and oats acquire a greater importance than elsewhere in France, while the eastward-facing escarpments offer shelter for important vineyards. The valley floors generally possess sufficient moisture for the cultivation of vegetables, though the low winter temperatures make it necessary for the more delicate plants to be grown under glass.

Flanders (4Aiv) stretches northward from the hills of Artois, and possesses an even more extreme climate than the Paris basin. Root crops, and especially sugar-beet, become important, and a great deal of land is under such hardy crops as flax and chicory. Grain, however, is independent of winter coldness, and remains important.

The Channel coast-lands (4Bii) have a climate which is practically indistinguishable from that of Southern England. Not only is rain abundant at all seasons, with short periods of warm weather and with sunshine in midsummer, but the winters are almost free from long periods of frost, and there is a great deal of cloud, even in autumn. The summers are cooler than in the other lowland regions of France, and it is impossible for crops such as maize to mature. The early autumn storms and cloudiness make it impossible for the vine to ripen in the open air, and the crops which are important are those which require mild winters, cool summers, and abundant rainfall. Oats is the chief cereal, and there is a great deal of permanent pasture on which horses and cattle are raised. In the parts where there is very little frost such orchard fruits as apples and plums are important, and a great deal of ground is used for the production of early vegetables, which are marketed in England in the early spring.

CHAPTER IV

FRANCE : EASTERN FRANCE

EASTERN FRANCE owes its geographical unity to its frontier position, its continental climate, its mineral wealth, and, above all, to its natural communications along the Meuse, Moselle, and Rhine valleys to Switzerland, Germany, and Belgium, on which countries it depends for its external trade and power resources.

SUB-REGIONS

1. The Vosges

The greater part of the Vosges consists of crystalline rocks which are covered by uncultivated woodlands and heaths, except in valleys, where the soils are deep enough for the growth of permanent pastures. The eastern slopes are steep, and form a natural defence line of France. The western slopes are gentler, the siliceous grits containing mineral springs and deposits of iron ore. These western slopes are not good for cultivation. Timber industries and the raising of cattle are the chief natural occupations. The south-west-north-east valleys provide easy communications across the upland region, though in the north, where the elevation is less than in the south, the unfertile nature of the Bunter Sandstone has been responsible for the continued existence of the forest, which formed an almost impregnable frontier for many centuries.

Three smaller regions may be distinguished within the Vosges area :

(a) The mountain district, which is covered with fine fir-forests, with here and there a few irrigated meadows and fields of potatoes and oats. Cheese-making is important here, the cheeses being collected from the farms for sale in Tholy and Munster. The forests have given rise to lumbering and

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paper industries, timber being marketed in Épinal and Saint-Dié and paper manufactured at Laval, the lakes of Gérardmer acting as reservoirs for supplying the falls utilized in the pulp industries. There are several spas—*e.g.*, Bains and Bussang. Pottery is manufactured from the grit clays at Rambervillers and Épinal.

(b) The foothills ("Vôge") of the South-western Vosges produce orchard fruits, such as cherries and plums, "kirsch" being manufactured. On the eastern side of the mountains the vine is important because of the drier and sunnier nature of the autumn months. On the west potatoes are extensively cultivated, starch being made at Épinal.

(c) The "Plain" ("La Plaine") is the area lying just above 1000 feet above sea-level in Lorraine, and forms a transitional district leading to the Lorraine plateau. Like that region, its soils consist of limestone (muschelkalk) and Triassic sands. This district is not suitable for the cultivation of cereals, but is important for its cattle and cheese.

The manufactures of the Vosges are still to a certain extent based on water-power. There was formerly an iron industry, but with the development of the 'minette' ores of Lorraine the only trace of it is the manufacture of iron goods at Baccarat and Cirey. Timber manufactures are still important, and furniture, paper, and musical instruments are made in many of the small towns.

It is, however, for its textile industries that the Vosges is principally important. Some of these, such as lace and embroidery, are household industries, but the linen industry of Gérardmer has been concentrated in modern mills. The chief development of the Vosgian textile industry was caused by the emigration of Alsatian cotton-spinners, -weavers, and -printers from Alsace after 1871, when France raised a high tariff against German cotton goods. Patriotism also played its part in causing Frenchmen to leave Alsace. As a result of the restoration of Alsace, Eastern France is now the principal cotton-manufacturing centre on the Continent. The chief cotton-manufacturing towns lie outside the more mountainous area in Alsace at Mulhouse and in Lorraine at Épinal and Saint-Dié. The latter lie at the outlets of the Moselle

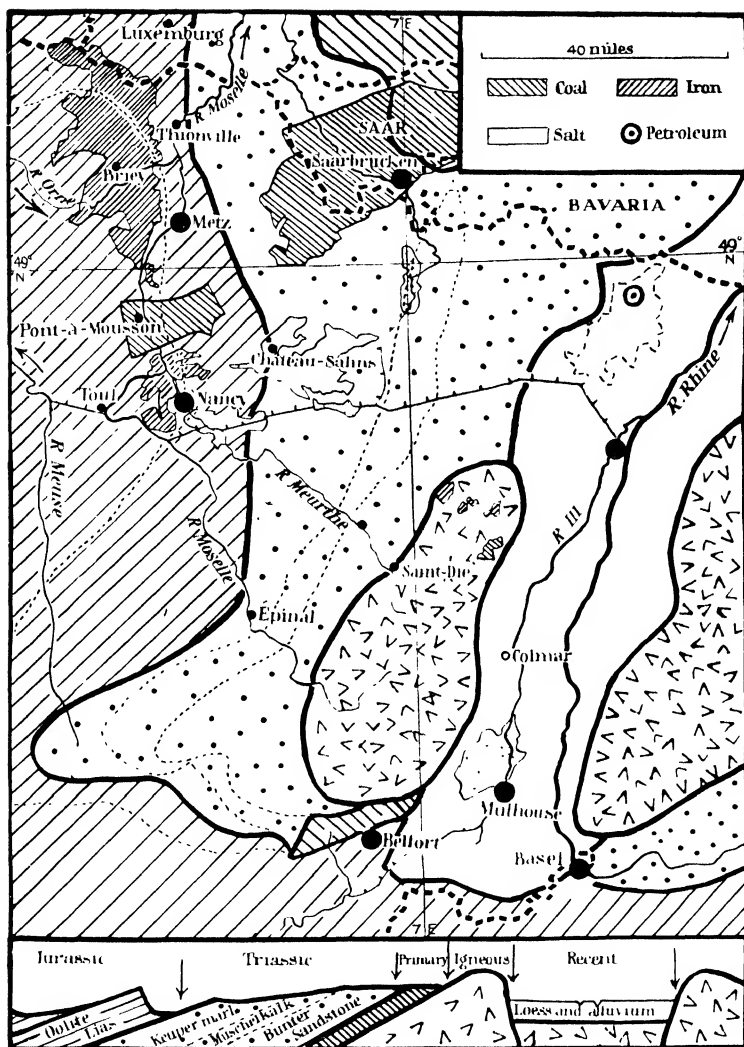


FIG. 13. OUTLINE OF THE GEOLOGY OF EASTERN FRANCE

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and Meurthe, on the Lorraine plateau and derive their importance from the numerous small rivers which join the main streams above them, thus causing a concentration of routes from the mountainous area and supplying power for their industries.

2. Lorraine

In geological structure Lorraine is part of the Paris basin, but its climate is much more extreme, the winters being cold and dry, with an abundance of snow. Moreover, unlike those of the Paris basin, which concentrate in the neighbourhood of Paris, the rivers of Lorraine flow northward, away from France. The Moselle and its tributaries, the Meurthe, Seille, and Saar, which flow from the Vosges, are marked by spring floods from the melting snows of the mountains and by autumn floods caused by heavy rains. This river links Lorraine with the Rhine at Coblenz. The Meuse is a much less powerful stream, which has lost its lateral tributaries by river capture to the Seine and Moselle, giving gaps through the Oolite and chalk escarpments at Toul and Bar-le-Duc. Except for these gaps the river system of Lorraine does not give easy communications with the Paris basin. On the whole the soils are not favourable for cultivation, except where the Oxford and Liassic clays are lightened by admixture with limestone washed down from the escarpments. The Triassic and Liassic soils generally make good forest and pasture-land. In parts of the Triassic area there are rich deposits of salt and pottery clays, but the most valuable mineral is iron ore, which is obtained from the Liassic and Oolitic limestones. Coal seams underlie a large part of Lorraine, and are a continuation of the Saar coalfield. Coal measures have been proved as far west as Pont-à-Mousson and as far east as the Bavarian Palatinate, in the neighbourhood of Kaiserslautern.

(a) The *Lorraine plateau* consists of grits and marls of Triassic and Liassic age. The grits form the highlands, which are forested with occasional clearings of potatoes and rye. The limestones are very fertile, and give rise to dairy industries based upon the abundant pasture. Even in the clay

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areas the Lorraine plateau is chiefly pastoral (*cf.* Cheshire), since the soils are too heavy for economic ploughing. Where cultivation is possible wheat and oats are grown. Above 1200 feet the valleys are clothed with pine-woods, but on the plateau itself there is no continuous forest, though there is a good deal of coppice land, especially near the numerous meres, which regulate the water-supply.

Large deposits of common salt are found in the Triassic rocks which lie between the Saar and the Moselle. These are worked at Saarlautern, at Saint-Nicholas, near Nancy, and in the Salines district, where Dieuze is the refining centre. In these districts chemical and soda industries are carried on, and material is also supplied to the earthenware and pottery industries of the Sarreguemines (Saargemünd) district. The Saar valley passed into German hands in 1870, and the French then established new works in other parts of France. At the present time the restoration of the glass and pottery district to France makes it difficult for English pottery to enter a market which was formerly a British monopoly.

The only coalfield in Lorraine is part of the Saar field. The coal is divided between three political units—the Bavarian Palatinate on the north-east, the Saar Territory, at present administered by the League of Nations, the coal being appropriated to France, and Lorraine, which contains two areas of workable coal. The coalfield lies in a north-east and south-west depression which is bounded on the east by a long and fairly straight fault beyond which the coal can be reached again in several places—*e.g.*, at St Ingbert, in the Palatinate. The central part is unexplored, but it seems probable that the coal seams are at too great a depth for profitable working, except in the south-west, near Pont-à-Mousson, where a transverse fault lifts the coal seams to depths where working is possible.

The coal is unsuitable for the manufacture of blast-furnace coke. It is therefore necessary that coke for the iron and steel industries should be imported from either the Ruhr, Aix-la-Chapelle, Dutch, Franco-Belgian, or British coalfields. The newly developed Campine coalfield, in Belgium, is beginning to supply part of the requirements of the Lorraine iron

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furnaces. The coal of Lorraine is, however, of considerable importance as domestic fuel and for the manufacture of gas used in the chemical and pottery industries. Before the War this area of the Saar and Lorraine produced about 14,000,000 tons of coal annually. Lorraine and the small fields of Alsace produced about 3,800,000 tons, and consumed about 9,000,000 tons. It is obvious, therefore, that the recovery of Alsace and Lorraine and the occupation of the Saar coalfield have done little to relieve the fuel shortage of France as a whole.

In 1912 the output of the Lorraine coalfield was about 3,500,000 tons. This has been increased since 1928 to 5,500,000 tons, the chief centres of mining being La Petite Roselle (Merlenbach), Hôpital (Karlingen), and La Houve (Kreuzwald). The coal is used chiefly for gas production and for domestic purposes, but in the case of La Houve electricity is generated. The power-station is being linked up with the electrical system of the North French coalfield and also with the hydro-electric system of Alsace and the Rhine (Rheinfelden and Laufenburg) and Aar (Olten).

(b) *Le Pays de Côtes*, on the west of the Lorraine plateau, forms the eastern extremities of the scarplands of the Paris basin. Here there is a series of Oolite limestone ridges running north and south. To the east of the broken hills lie the Liassic clays which form the valley of the Moselle from Nancy to beyond Metz. To the west Upper and Middle Oolite rocks form the Côtes de Meuse, while the Jurassic clays widen out in Lorraine to form the clay depression of the Woëvre. This district of hills and clay valleys varies much in fertility. The distribution of population is accounted for by the existence of the iron ores, which has stimulated the production of foodstuffs in the country between the Meuse and the Moselle.

The Moselle valley follows the belt of Liassic clays which lie to the east of the outcrop of the Dogger Beds, which form the base of the Oolite series. In 1871 the victorious Germans fixed their new frontier at the western limit, where the German language was spoken, and as a result a considerable number of French-speaking people moved westward into the

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valley of the Moselle. The subsequent influx of German workmen caused the linguistic frontier to move still farther west.

Up to that time Nancy had been a quiet market town, but the opening up of the iron ore outcrop on the west bank of the Moselle led to the rapid development of smelting in the neighbourhood, and new shafts sunk in the Briey and Longwy districts proved that the minette ores of Thionville and Metz were continued to the west of the new frontier. Between 1891 and 1906 the population of the iron-working areas in the Moselle valley was trebled, and the little villages of Jeuf, Homecourt, and Auboue, which had depended on wheat grown on the heavy clays and on the communal pastures which surrounded the fields, became a densely populated industrial district which gave employment to immigrant Belgian, German, and Italian workmen. A local market was thus provided which stimulated agricultural production. Lorraine is really cornland, the only natural pastures being in the valleys. Nevertheless, since 1878 the area under cereals has declined, while the amount of land devoted to the production of meat and milk has increased sixfold. The area under hops and vines has also increased in response to the greatly increased local demand. Pigs are raised on a large scale, and Metz has become the third food market of France.

In 1913 French Lorraine produced 20,000,000 tons of iron ore, more than nine-tenths of France's total output, while in German Lorraine 21,000,000 tons of ore were raised, nearly three-quarters of Germany's output. Except Luxemburg, which produces 7,000,000 tons of ore annually, the whole of the former German ore district is now in the hands of France. In many respects the Jurassic districts of Eastern France resemble those of England, but there are several important differences. In England the Jurassic formations outcrop from Middlesbrough to Portland, and in no case do their escarpments possess gaps which have any military importance. In France, on the other hand, the Jurassic scarp-lands form a defensive frontier, and their gaps command routes of great commercial and strategic importance. Further, though in Britain the most important iron ore deposits occur in the Jurassic rocks they are scattered, and the mining

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districts extend from Oxfordshire to the North Yorkshire moors, while in Lorraine, in a relatively small area, lies the most important iron-mining district in Europe. In neither case are there any important arable areas, though in France cultivation is carried to a height of more than 1000 feet above sea-level (*cf.* 500 feet on the North Yorkshire moors).

The Iron Industry of Lorraine

Distribution of Iron Ore. With the exception of parts of the Briey plateau, the minette deposits lie wholly within the Moselle basin, and there are almost continuous deposits of iron-bearing rocks between Luxemburg, Longwy, Briey, and Nancy, a distance of nearly seventy miles, the width averaging twenty miles. More than one-third of this area contains workable deposits. The minette deposits (5,000,000,000 tons) contain more than half the iron ore reserves of Europe, and exceed in quantity the known reserves of ore round Lake Superior. At the present rate of output, 50,000,000 tons, the deposits will last for a century even if the hidden reserves which lie to the south-west of the mining area are not exploited. The Luxemburg deposits may last for forty years, but practically the whole of the reserves are in France. The local coalfields also contain iron ores, the deposits extending from Pont-à-Mousson north-eastward as far as Lautenbrücken (thirty-three miles south-west of Bingen), with an average width of fifteen miles. More than half the latter area is occupied by coal measures which contain iron.

Though iron ores have been discovered within the area of which the corners are Luxemburg, Pont-à-Mousson, Nancy, and Kaiserslautern, almost the whole of the ore mined is obtained from the Longwy, Crusne, Briey, and Nancy basins.

The Longwy basin occupies the upper parts of the Chiers (Meuse) and Alzette (Moselle) valleys, and supplies both Luxemburg and French ironworks. Though declining somewhat in importance the French portion of the basin produces 3,000,000 tons per annum, while the estimated reserves are about 300,000,000 tons. In Luxemburg, however, the output is about 7,000,000 tons (*cf.* 7,300,000 tons in 1913).

The Crusne basin occupies the head of the Crusne (Meuse)

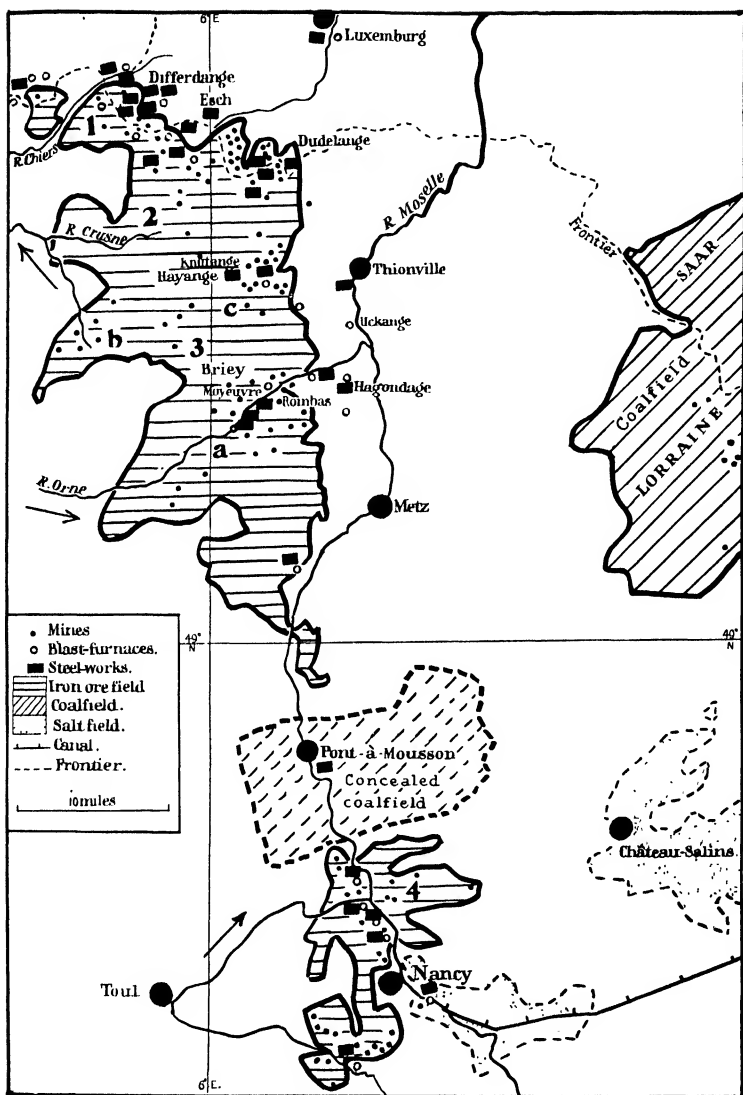


FIG. 14. IRON INDUSTRIES OF EASTERN FRANCE

1, the Longwy basin. 2, the Crusne basin. 3, the Briey basin: *a*, the Orne district; *b*, the Tucquenieux district; *c*, the Landres district. 4, the Nancy basin.

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valley, and has not yet been fully developed. The reserves are about 500,000,000 tons. As in the case of the Longwy basin, the ores are siliceous, and require the addition of a fluxing material for use in blast-furnaces. The Briey basin and its continuation in the Moselle contains calcareous ores which are widely used with the siliceous ores to form self-fluxing mixtures. For this reason they reduce the cost of producing pig-iron below that of the areas which have to import limestone for fluxing. The chief centres of mining in the Briey ore basin are the Orne valley, the Landres district, and the Tucquenieux sub-basin, in the upper part of the Fentsch (Moselle) valley.

As the ores lie nearer the surface in the east, working costs are lower toward the eastern edge of the Briey basin, and in the Metz-Thionville district there are many open and hill-side workings, power being obtained from the waste gases of the steel-works and blast-furnaces. Moreover, as many of the works of French Lorraine were destroyed during the War, production recovered more quickly on the eastern fringe of the Briey field. In 1928 the output of the principal mining areas was: Metz-Thionville 20,404,000 tons, Briey 19,359,000 tons, Longwy 3,066,000 tons, Nancy 1,453,000 tons. As the older works are now repaired and the new German works at Rombas, Knutange, and Hagondage taken over by France, the output has exceeded pre-War levels. From Pont-à-Mousson ironworks the industry was removed to Rouen and South-western France during the War, and the works were not repaired till recently. The reserves of the Briey basin are about 2,000,000,000 tons, the present output being 19,000,000 tons of ore. The Nancy ironfield, which lies along the west bank of the Meurthe and across the Moselle, near Nancy, was formerly the chief centre of the French blast-furnace industry. At the present time the local output of ore seldom exceeds 2,000,000 tons, and Nancy is chiefly important as an iron- and steel-manufacturing centre. The principal mining centres at the present time are Hagondage (840,000 tons of ore in 1927), Hayange (824,000 tons), Rombas (177,000 tons), Moyeuvre (175,000 tons), Thionville (166,000 tons), and Uckange (129,000 tons).

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In 1913 the total output of minette ore was nearly 49,000,000 tons (*cf.* U.S.A. 62,000,000 tons, Britain 16,000,000 tons). Of this French Lorraine produced 20,000,000 tons and exported 9,000,000 tons to German Lorraine and Luxemburg (70 per cent.), to the Ruhr (13½ per cent.), to the Saar (13 per cent.), and to Belgium (1 per cent.). Only 2 per cent. was sent to other parts of France. The rest (11,000,000 tons) was consumed in French Lorraine near the mines. At the present time the iron and steel industry of German Lorraine is in the hands of France, and relatively little ore is exported before manufacture. Of the 50,000,000 tons of ore raised in the minette fields in 1927 32,000,000 tons were consumed within the borders of Lorraine and Luxemburg, 8,500,000 tons (17 per cent.) went to Belgium, 4,730,000 tons (9½ per cent.) to the Saar, 2,100,000 tons (4 per cent.) to the North French coalfield, and 2,100,000 tons (4 per cent.) to Germany.

PRODUCTION OF IRON ORE

	1913	1928
Metz-Thionville	21,136,000 tons	20,404,000 tons
Briey	15,104,000 „	19,359,000 „
Longwy	2,959,000 „	3,066,000 „
Nancy	1,916,000 „	1,453,000 „
Luxemburg	7,333,000 „	7,027,000 „
Total	48,448,000 „	51,309,000 „
Consumed in Lorraine and Luxemburg	—	31,834,000 „
Exported	—	17,586,000 „
Exported to Germany	4,607,000 „	2,142,000 „

The Development of the Iron Industry. The Meuse head-streams are torrential and supply water-power, whereas those flowing into the Moselle in the iron region have practically level courses and little water-power. The beginning of iron manufacture in the minette districts dates from the Middle Ages, when there were numerous furnaces (using surface ores and locally produced charcoal) in the valleys of the Fentsch and Orne. In the seventeenth century furnaces were established at Moyeuvre, Ottange, Hayange, and elsewhere, and the number of small ironworks gradually

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increased until by 1870 there were thirty blast-furnaces in Alsace and Lorraine. Modern development dates from about 1880, when the Thomas-Gilchrist process was introduced. By 1914 there were sixty-seven furnaces in German Lorraine and seventy-nine in French Lorraine.

Prior to 1856 nearly two-thirds of the iron of commerce was produced in Britain. In that year Bessemer published the details of his process, which consists of blowing air through molten pig-iron to remove the excess of carbon usually present. This materially cheapened steel, but the presence of phosphorus in most iron ores limited its use to the high-grade ores of Cumberland, Sweden, and Spain. These ores are still used in the Bessemer furnaces, and there are considerable reserves of undeveloped high-grade non-phosphoric ores, such as those of Brazil, but economic conditions render the prospect of their immediate development unlikely. The existence of very large deposits of phosphoric ironstone in the Jurassic rocks of Cleveland and Lorraine led to experiments which culminated in the invention of the Thomas-Gilchrist process, which revolutionized iron-manufacturing throughout the world. The method consisted of lining the Bessemer converter with lime and magnesia mixed with tar, use being made of the Magnesian Limestone of South Durham in the furnaces of Middlesbrough. The effect of the basic materials is to remove the phosphorus by forming what is known as basic slag, a valuable fertilizer when powdered. The immediate result of the successful demonstration of this process was to render the enormous deposits of phosphoric ore in Europe available for steel-manufacturing. Four-fifths of the British and nine-tenths of the French pig-iron is now made from Jurassic ores containing phosphorus. The development of the Lorraine mines was very rapid, and four-fifths of Germany's ore came from the minette deposits in Luxemburg and Lorraine. Without the assistance of Lorraine ores it is doubtful if Germany could have undertaken the recent war.

Many of the old charcoal furnaces were abandoned, but those which were connected by rail were modernized. In the Longwy district there had been only one furnace, in the

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Chiers valley, but from this has grown up a street of mines, furnaces, and workmen's dwellings which stretches along the valley as far as the Belgian frontier. In fact, many Belgians travel daily into this part of France to work. The introduction of the Thomas-Gilchrist process led to the migration of blast-furnaces from the coalfields to the orefields, because it is cheaper to transport one ton of iron than the three tons of ore needed to produce it. In order to avoid congestion coke is carried from the Ruhr along the right bank of the Rhine, where there are few large towns, thus avoiding the heavy passenger-traffic route between Cologne and Coblenz. Coke is also sent from Aix-la-Chapelle and Liège *via* Trois-Vierges, and the output of the Belgian coalfields is supplemented by coke made at Zeebrugge and Ghent from coal imported from England. As coke is six times as bulky as iron ore, many of the trucks return empty to the coalfields, and the freightage charges on exported semi-finished steel goods is remarkably low.

Considerable use is also made of water transport, some of the Briey ore being carried by rail to Givet, and thence by water to Liège. A little ore is carried by rail to Ludwigshafen, but the most important movement of ore by water is through Strasbourg, which exports 1,146,000 tons of ore annually to the Ruhr. Two-thirds of Nancy's ore export is carried by water, 200,000 tons being carried by barges to North France and Belgium. In return the barges bring back 700,000 tons of coal. Though connected by canal with the Meuse and Moselle, the Saar receives nine-tenths of its ore by rail. It has been proposed to construct a canal from the Orne to the Meuse and Sambre, but it would be difficult to maintain an adequate water-supply in the higher levels.

The two chief factors in the pre-War development of the iron and steel industries of Lorraine were the cheapness of the ores and the accessibility of the Ruhr coke-producing region. During the post-War period practically the whole of the iron ore districts have become the property of France, but although she now holds more than half of Europe's iron-ore reserves France has only 5 per cent. of Europe's coal reserves. It is therefore impossible for France entirely

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to monopolize Europe's iron-manufacturing industry, as her output of coke is quite inadequate.

Attempts were made by France to obtain control of the coke output of the Ruhr, first by exacting reparations in the form of coke, and later by occupying the industrial region of Rhenish Prussia. This occupation was a disastrous failure, as the German miners and railwaymen refused to work for the French, and were supported in their attitude by the united German nation, which fed and clothed the refugees expelled by the French. Moreover, Britain tactfully pointed out to the French that the occupation of the Ruhr was a breach of the Peace Treaties, and juridically unjustifiable. The results were disastrous for France in that the supply of coking coal was so restricted that the price of English coke rose to unprecedented heights and materially weakened the exchange value of the franc.

France has become less dependent on German coke, and supplies are now obtained from the Campine and Dutch coal-fields. Belgium now produces nearly 6,000,000 tons of coke, and there has been a great increase in the coke production of the North French coalfield. The Saar also produces 33 per cent. more than in 1913, and there has been a reduction in the amount of coke needed per ton of metal produced by smelting. Nevertheless, Germany remains the principal source of coke used in Lorraine, 5,500,000 tons being obtained from the Ruhr and 400,000 tons from Aix-la-Chapelle.

WORLD PRODUCTION OF PIG-IRON IN MILLIONS OF TONS

	1913	1928
World	78	80
U.S.A.	31	39
Germany	19 ¹	12 ²
Britain	10	7
France	5 ³	10 ⁴
Luxemburg	2½	2½
Belgium	2	4
Saar	1	1
Russia	5	3

(It should be noted that Germany is now largely dependent on Sweden and North Africa for her iron-ore supplies.)

¹ Pre-War area. ² Post-War area. ³ Pre-War area. ⁴ Post-War area.

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The steel output of Lorraine is now greater than before the War. In fact, the whole of the great steel-producing triangle (Nancy-Charleroi-Dortmund) has more than recovered its pre-War position, consuming 53,000,000 tons of minette ore and importing 15,000,000 tons from Sweden, and Southern Europe (Spain, Greece, and Algeria). More than 28,000,000 tons of steel are now produced within this area (*cf.* 25,000,000 tons in 1913). Lorraine produces 7,734,000 tons of pig-iron and 6,400,000 tons of steel annually (*cf.* the Ruhr, 9,000,000 tons of pig-iron and 11,500,000 tons of steel). There are blast-furnaces and steel-works in all the Lorraine orefields, but the blast-furnaces lie chiefly in the Fentsch and Orne valleys and at Thionville, Uckange, Hagondage, and Ars, between Thionville and Metz. The chief steel centres are Hayange, Rombas, Moyeuvre, Knutange, and Hagondage, in the Briey and Metz-Thionville districts, and Pompey and Nancy in the south.

WORLD PRODUCTION OF STEEL IN MILLIONS OF TONS

	1913	1928
World	75	104
U.S.A.	31	52
Germany	17 ¹	14 ²
Britain	8	9
France	5 ³	9 ⁴
Luxemburg	1	2½
Belgium	2½	4
Saar	2	2
Russia	4	4

A great change is in progress in the French steel industry. Formerly the raw steel manufactured in Lorraine was sent to Germany to be made into steel goods, but at the present time a large proportion of the steel is made into semi-finished goods (merchant steel, rails, bars, joists, and wire) at the steel-works. Much of the Lorraine steel is finished in the North French and Centre coalfields. Industrial combinations are more common than before the War, and the operations of the French steel trusts extend over the whole of France, Belgium, and Luxemburg.

¹ Pre-War area. ² Post-War area. ³ Pre-War area. ⁴ Post-War area.

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Communications of the Moselle Basin

The Moselle is navigable for light barges, *peniches flammantes*, from Épinal to Metz, but below Ens Dorf, on the Saar, and Metz, on the Moselle, neither the Saar nor the Moselle has a depth of more than a metre during the low-water season, and attempts to carry coal from Coblenz to Thionville have proved too costly to compete with rail-borne coal even during the winter months. As early as 1867 it was proposed to canalize the Moselle as far as Metz, but under German ownership the canal was not made, because of the German Government's desire to support their State railways. Since 1919, however, the scheme has been revived, with the object of making the Moselle and Saar navigable for the large 1500-ton Rhine barges as far as Dombasle, where the Rhine-Marne Canal crosses the Moselle and Sarreguemines on the Saar Canal (*des houillères*). It is probable that the improvement of the Moselle waterway would enable the heavy loads of timber, ore, and pig-iron to be carried cheaply between Westphalia, Lorraine, and the Paris basin, and it is possible that communications by water might be profitably developed with the Campine coalfield. As it is, the deep Saar Canal, which branches off the Rhine-Marne Canal at Gondrexange and joins the Saar between Saaralben and Sarreguemines, is little used, and carries less than half a million tons of coal per annum.

The Saverne (Zabern) Pass is the only easy route across the Vosges north of Belfort, and carries both canal and railway. The Rhine-Marne Canal, constructed between 1838 and 1853, links Strasbourg with the French system at Nancy and Vitry-le-François. South of Nancy it connects with the Canal de l'Est, which leads to the Saône and the Rhône. Farther west, at Troussey, there is a connexion with the Canal du Nord, and thence to the Canal des Ardennes and the Belgian waterways, though there is little traffic along the Meuse south of Dinant. At Vitry-le-François the Rhine-Marne Canal joins the Aisne-Marne Canal, giving through communications at a depth of two metres with the waterways of North-west France. The Metz-Strasbourg railway, the

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Strasbourg-Nancy railway, and an important military road which was formerly part of the old coach road from Paris to Vienna also pass through the Col de Saverne.

The Belfort gap, which forms a wide valley between the south of the Vosges and the north of the Jura, is one of the most important passages in the world. Through it has come wave after wave of immigration from Central Europe into France, and it has consequently become one of the most important military routes in European history. The actual gap, however, is scantily populated, as the traffic is concentrated in the "Trouée de Belfort," a level trench which lies near the middle of the wider gate. This trench carries the canal and railway, which connects Upper Alsace with the rest of France.

The Rhine-Rhône Canal runs southward from Strasbourg through Mulhouse, and joins the canalized Doubs at Montbéliard. Unfortunately this canal is not of uniform depth, and though the depth of two metres enables heavy traffic to reach the great textile and engineering district of Alsace the navigation to the south of Mulhouse is limited to barges of 170 tons. This practically prevents the use of the canal for through traffic between the Rhine and the Rhône. The Mulhouse-Besançon railway forms the main route from Paris to Basel, and serves both Alsace and Switzerland.

The Towns of Lorraine and the Saar Territory

In a frontier region the chief towns are generally fortresses, situated either at gaps in the hills or on easily defended hills commanding bridges across the rivers. The principal town in the Lorraine region is Nancy (114,000 inhabitants), situated at the western edge of the plateau, where several small streams enter the Meurthe a few miles above its junction with the Moselle. To the west there are forests, and to the east there is pastoral country. Until the German conquest of Lorraine in 1870 Nancy was a small market town with agricultural industries, such as tanning and domestic embroidery, and cotton cloth manufactures. Though fortified, it was of less importance than Metz, where the principal

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frontier garrison was stationed. The alteration of the frontier after the Franco-Prussian War and the development of iron industries to the west of the Meurthe and Moselle made Nancy one of the principal fortresses and iron-manufacturing centres of France. It has important chemical-works based on local salt-supplies. Metz (69,000 inhabitants), a Roman city commanding the route between France and the lower Moselle, derives its importance, like Nancy, from its strategic position, and because it is the chief railway centre near the northern ironfields of Lorraine. Trèves (50,000 inhabitants), commanding the lower Moselle, lies below the junction of the Sauer, Saar, and Moselle, and is the natural junction for the traffic of Luxemburg and the Saar valley. With the exception of York it was the only Imperial city north of the Alps in Roman times, and retained its military and ecclesiastical importance throughout the Middle Ages. Before the Germans captured Lorraine it was the principal German frontier fortress on the Moselle, but during the period preceding the European War it declined somewhat in importance as a military centre. It is a market for the wines of the Moselle and for the corn, timber, and coal of the district. It possesses small textile industries, and is connected with the Rhine at Coblenz by small steamers which carry passengers and small parcels of goods.

Saarbrücken (125,000 inhabitants) is the chief town in the Saar valley, which produced about 17,000,000 tons of coal in 1913, more than 9 per cent. of the German output, 1,300,000 tons of pig-iron, and about 2,000,000 tons of steel. The Saar valley is also important for the manufacture of glass, chemicals, and pottery. The town owes its importance to its being the principal railway centre of the coalfield. Until 1934 the Saar coalfield must be considered as part of France, because of the terms of the Treaty of Versailles, which placed the output of the Saar mines under French control as compensation for the damage done in the North French coalfield. During the French occupation the number of miners employed has risen, though the output of coal has not reached the level of 1913. For the time being the franc has been introduced, and a customs frontier placed between

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the Saar district and the rest of Germany. As the normal market for the Saar coal is in Germany, and as France has not been able to absorb all the coal produced, the economic position of the inhabitants is not secure. Polish workmen have replaced Germans. French schools have been set up, and German opinion has been inflamed. The responsibility for the administration of the Saar district rests with the League of Nations, which will have to make arrangements for the plebiscite which will, in 1934, determine its political and industrial future. Since 1919 there have been several political agitations for placing parts of the Rhine valley under the League of Nations as independent territory, and there has recently been a demand for autonomy even in Alsace. It seems, therefore, that the political future of the frontier zone between France and Germany is by no means finally settled, for though there is no great demand for re-union with Germany the people speak the German language, and have not yet found complete prosperity inside the customs frontier of France.

3. Alsace

Alsace has less of the transitional character of Lorraine, and is isolated from the rest of France. In fact, it may be regarded as an integral part of the economic system of the Rhine basin, with intimate relations with Germany and Switzerland. The majority of its people use German as their common tongue, though French is now taught in the schools.

Regions of Alsace

There are two physical regions in Alsace—the Rhine plain and the Alsatian slopes of the Vosges.

(a) The *Rhine plain* is more than a hundred miles long, and averages about fifteen miles in width. On the extreme south it is bounded by the Swiss Jura, which reaches a height of between 2000 and 2500 feet above sea-level. On the whole, however, it consists of recently formed soils and of alluvium which is still being deposited along the low-lying parts which are flooded by the Rhine. In consequence,

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there are few towns actually on the Rhine, and the chief urban centres lie along the valley of the Ill, which flows in a course almost parallel to that of the Rhine and intercepts the short and rapid streams which come down from the Vosges.

The belt of alluvium extends from Basel to Neu Breisach, where it widens out to include the lower part of the valley of the Ill. The western and southern parts of the plain lie at a somewhat higher elevation, and are covered throughout by glacial deposits, except in the neighbourhood of Mulhouse, where there is an outcrop of Tertiary deposits. The principal drift deposits are the loams of the districts between Mulhouse and the Jura and the tracts of loess which lie along the base of the Vosges as far as Strasbourg.

The alluvial region may be divided into two parts—the Hardt and the Reid. The Hardt comprises the relatively narrow strip which lies along the west bank of the Rhine between Basel and Neu Breisach. Its subsoil consists of gravel, and though it is liable to floods it is practically waterless, and, but for a few stunted oaks, treeless. Its principal use is as rough pasture-land. The Reid lies to the north of Kaiserstuhl, the limit of navigation of the Ill, and extends along the valleys of the Ill and Rhine as a marshy tract drained in places to form cattle pasture.

The glacial soils extend throughout the south of the Ill and along the west of the alluvial districts farther north. The varying quality of the soils allows four districts to be distinguished—the Sundgau, a tract of fertile loams between Mulhouse and Thann; the Kochersberg, where fertile loess, which forms the best farmland in Alsace, extends as far north as Strasbourg; the Ochsenfeld, an arid district between Mulhouse and Thann; and the northern plain to the north of Strasbourg. The soil of the northern plain is sandy, with patches of stones. Except in the Forest of Haguenau the northern plain forms good agricultural land.

(b) *The Alsatian Slopes of the Vosges*. It is to the Vosges that Alsace owes its sunnier and drier climate. As in the case of the western slopes, the east of the Vosges is covered with forests—e.g., the Forest of Wasselonne—and permanent

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pastures, while the streams yield abundant water-power, which has given rise to industrial activity similar to that of the Western Vosges.

Agricultural Developments

Although more people are engaged in manufactures (40 per cent.) than in agriculture (33 per cent.), the latter industry is important throughout Alsace. Arable land occupies two-thirds of the total area, and, in contrast to conditions in Lorraine, one-third of the total area is under cereal crops. A quarter of the surface consists of permanent pasture. Cultivated meadows and vineyards together cover one-tenth of the whole country, and there is a small area under orchard fruits. Half the arable land is under grain, wheat being more important than barley, rye, or oats. Little maize is grown, but potatoes and beet are the most important forage crops. Industrial crops, such as tobacco, hops, flax, and market-garden produce, are confined to the neighbourhood of the towns and especially of Strasbourg, Basel, and Colmar.

Permanent grassland covers nearly a quarter of the whole country, the marshes of the Reid and the mountain pasture being the chief pastoral areas. River meadows are important for dairy cattle. With the extension of dairy-farming sheep are becoming less important. Orchards and vineyards occupy about 5 per cent. of the total area, apples being exported from the Ill valley to Switzerland, while the grapes are made into wine in the sheltered valleys of the Vosges foothills, especially at Turckheim.

Mineral Production

Mineral salts are the most important substances mined in Alsace, though there are small areas of petroleum and coal. Potassium salts were discovered in 1904 in Oligocene deposits lying between Rouffach and Colmar on the north, the Rhine-Rhône Canal on the east, and Mulhouse on the south. By 1913 a large number of borings had revealed the presence of potash and rock-salt of considerable commercial value. During the period 1904-19 Germany possessed a virtual monopoly of the world's potash-supplies, but this came

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to an end with the Treaty of Versailles, and for a time there was keen competition between Alsace and Stassfurt. In 1924 an agreement was made whereby Alsace was to produce about one-third and Germany two-thirds of the world's potash output, in order to maintain a relatively high price level. The Alsace deposits are richer and more easily worked than those of Germany, and during their short period of development have given rise to many important chemical-works along the Rhine—*e.g.*, at Ludwigshafen, Leverkusen, and Düsseldorf. The chief potash-mines are at Bollwiller, Willenheim, and Ensisheim, at the junction of the Thur and Ill. During the War the shortage of potash in the countries allied against the Central Powers caused an investigation into alternative sources of supply. These were found in many places, and, above all, in the United States, where work was begun at Lake Searles, in California, and in the Bitter Lakes of Wyoming. In Britain kelp (seaweed) was again gathered, and a process developed for the recovery of potash from the flue gases of blast-furnaces. Nevertheless, after the close of hostilities it was found that the new sources could not compete with those of Alsace and Germany. The world-market, however, is now informed of the existence of undeveloped potash deposits in Catalonia, Overijssel (Holland), Venezuela, Chile, and Perm, and the Poles have reopened the old workings at Kalusz.

Coal is found in small deposits in Upper Alsace, but the output is inconsiderable, most of the coal used in the region being imported through the port of Strasbourg. Petroleum has been worked for the past fifty years near Walburg, in the Pechelbronn district, which lies to the north of Haguenau, at the junction of the foothills and the Rhine plain. In 1911 the output was about 44,000 tons of light oil, and in order to keep the works open the French Government has decided that all petrol sold in France shall contain a small percentage of Alsatian oil.

Alsatian water-power is equivalent to that which could be produced by the annual consumption of several million tons of coal, and steps are being taken to develop hydro-electric power on a large scale. The Rhine, between Basel and

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Strasbourg, possesses about 800,000 potential horse-power. Unfortunately there are no waterfalls, and it is necessary to

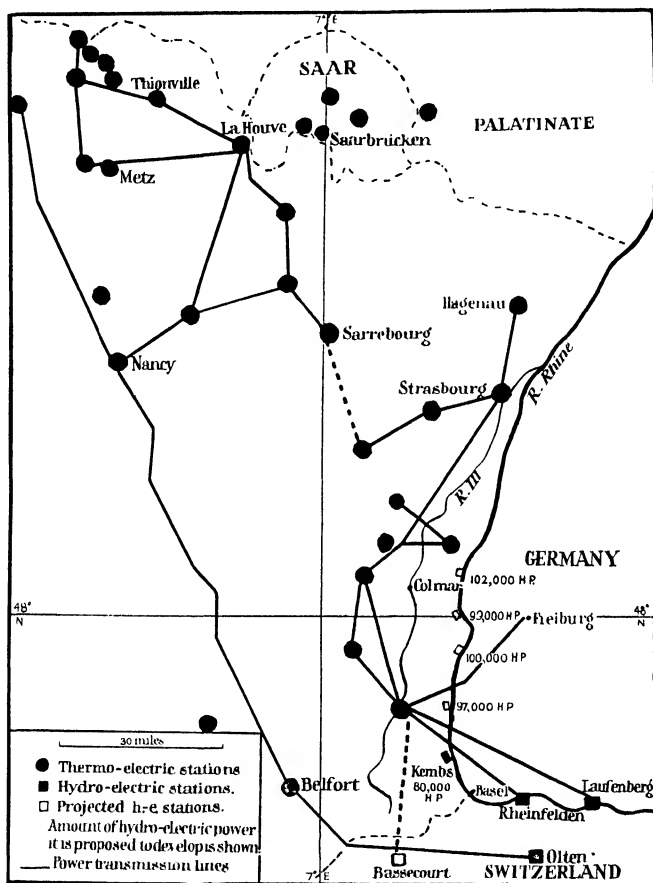


FIG. 15. MAP OF ELECTRICAL POWER DISTRIBUTION IN ALSACE-LORRAINE

have several rather expensive artificial barrages and locks. It is proposed, therefore, to construct a channel on the French bank of the Rhine between Huningue (Hünigen) and Strasbourg, with hydro-electric stations at Kembs (Istein Rapids),

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Hambourg, Bodelsheim, Markolsheim, Diebolsheim, Gerstheim, and Neuhof.

The Kembs station has been completed, and supplies power in the Mulhouse and Haut-Rhin districts (65,000-110,000 horse-power).

When the Canal d'Alsace stations are completed nearly 5,000,000 tons of coal will be saved annually. Moreover, the Vosges tributaries of the Ill possess power equivalent to that produced by 1,000,000 tons of coal. A considerable amount of the power at present consumed at Mulhouse is derived from coal and from electricity imported from the Rhine above Basel. Coal, however, is still the chief item of traffic both by railway and by water.

The chief centres of water-power in the Ill valley are at Münster, on the Fecht river, Kayserberg, on the Weiss, Guebwiller and Rouffach, on the Lauch, Wesserling and Thann, on the Thur, Masevaux, on the Doller, Montreux-Vieux and Dannemarie, on the Larg, and at Hirsingen, on the upper Ill. The electrical distribution net connects Mulhouse with Baden, and a great deal of power is derived from Laufenburg and Rheinfelden, above Basel. The two latter stations are important, and distribute power to Switzerland, Baden, and Alsace.

Manufactures

The abundance of local wool and flax gave rise to domestic spinning and weaving, and the abundance of water-power led to the early development of machine industries. The water of the Vosges is extremely soft, and therefore suitable for washing, bleaching, and dyeing. It has already been noted that the western slopes of the Vosges were noted for fine workmanship in lace and embroidery, and it was to the skill and taste of the local workers that Mulhouse owed its early success as a centre of cotton-printing. Early in the eighteenth century the fabrics were obtained from India for the cotton-printing industry. Unfortunately, though the patterns made were extremely popular, Mulhouse was not free to export its fabrics to the French market until 1798, when Alsace was annexed by France. This opened the French

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market to Alsatian textiles, and in 1800 spinning and weaving were begun. By 1870 Alsace possessed 25 per cent. of the cotton spindles and 40 per cent. of the cotton looms of France, the home market being protected by high duties. The cession of Alsace to Germany removed the stimulus of the French tariff, and coarser materials were made during the time needed to establish Alsace's cotton goods in the world-market. By 1913 Alsace possessed 1,750,000 cotton spindles (15 per cent. of the German total), and calico, voiles, and satins had become specially important. Some of the machinery was made at Mulhouse, but the greater part was imported from England. When Alsace was restored to France in 1919 the rivalry with Lille and Rouen recommenced, but Alsace has retained its importance, and now possesses 26 per cent. of the cotton spindles, 23 per cent. of the woollen spindles, 30 per cent. of the cotton looms, and nearly 5 per cent. of the woollen looms of France. With Lorraine, Alsace now forms the chief cotton-manufacturing area on the continent of Europe, though its woollen industry is not very important. The two chief centres are Mulhouse and Colmar—Mulhouse, with its surrounding valleys, being engaged in spinning, weaving, finishing, bleaching, cotton-printing, and in the manufacture of textile machinery; Colmar, with Sainte-Marie-aux-Mines, Münster, Kayserberg, and Rottau, specializes in weaving. Fabrics are made at Mulhouse, Guebwiller, Colmar, Turckheim, Münster, and Lézebach. Bleaching and finishing are specially important in the valley of the Thur. Yarn and cloth are made at Wesserling, Cernay, Thann, Weiler, Moosch, and Saint-Amarin. Cotton and woollen mixtures are made in the valley of the Liépvrette, at Sainte-Marie-aux-Mines, and in the Doller valley. There is also a considerable ribbon-manufacturing industry near the Swiss frontier, where branches of Swiss firms of Basel and Zürich have established factories outside the customs frontier at Huningue and St Ludwig. During the War certain districts were badly damaged, especially near Münster, Sainte-Marie, Cernay, and Altkirch, and more than a quarter of the textile machinery was destroyed. The whole of the machinery has now been restored and modernized.

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The absence of local supplies of coal and iron has made it necessary for the metal manufactures to assume specialized forms. Mulhouse produces textile machinery, gas-engines, and steam-engines. Graffenstaden makes locomotives and machine tools; Neiderbronn and Reichshoffen manufacture wagons, metal articles, and hardware; Molsheim and Montzu, near Saverne, make tools; Selestat makes tools, metal clocks, and safes. As Mulhouse is the chief town near the potash-mines, it manufactures chemicals, especially those needed in the production of dyes.

Agricultural manufactures are chiefly carried out in the large towns, and especially at Strasbourg (*cf.* Metz). Flour-milling is important, a quarter of a million tons of wheat being produced in Alsace, and a further half million tons imported. Being a port with a large industrial hinterland, Strasbourg is the best place for food industries, and specializes in the preparation of cooked and preserved meats, chocolate, and *pâté de foie gras* (*cf.* Périgueux, Angoulême, and Toulouse).

Towns of Alsace

The principal towns of Alsace are situated on the Ill and its tributaries. Strasbourg (174,000 inhabitants) (*Strasse, Burg*) originated as a frontier post during the Roman period because of its strategic position, where marshes and streams offered an easily defended situation at a point where routes converged from the Black Forest and from the gaps in the Vosges formed by the Saverne gap and the Breusch valley. With the development of medieval trade the road between Paris and Vienna, which crossed the Rhine near Strasbourg, became the chief military and commercial road in Europe, and as the surrounding country made it an important local market the town at the crossing of the Rhine and Ill became the principal urban centre, fortress, and university town of the Rhine Rift Valley.

With the modern development of railways passing from the Black Forest to the Saverne gap, it became an important railway centre. The completion of the railways which used to end near the crest of the Vosges into Lorraine and

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Meuse-et-Moselle should greatly increase the junction traffic of Strasbourg and facilitate the distribution of its food manufactures—flour, beer, wine, pastes, etc.

Three important canals meet at Strasbourg—the Canal d'Alsace from Huningue, the Rhine-Rhône Canal from the Doubs and Saône, and the Rhine-Marne Canal from the Paris basin and Nancy. Because of its railways and canals the hinterland of the port of Strasbourg includes Lyons, Vesoul, Besançon, Dijon, and Lons-le-Saunier, as well as the greater part of Alsace and much of Lorraine. This region imports through Strasbourg 2,000,000 tons of coal, 150,000 tons of petroleum, 400,000 tons of wheat, 110,000 tons of other cereals, 50,000 tons of fertilizers, and 100,000 tons of wood-pulp, so that the port ranks after Marseilles, Havre, Rouen, and Paris. In respect to the kind of trade it carries on, Strasbourg is a sea-port rather than a river-port, as it deals with the import of commodities in bulk which it has exceptional facilities for distributing, as it is the centre of routes leading to the Black Forest and South Germany, routes climbing the Alps and ending at Venice and Genoa, routes to Lyons, Marseilles, and Paris, as well as those which connect it with the great markets of Flanders and Holland. In the sixteenth century Strasbourg was the centre which commanded the river traffic to Mainz, though this was practically confined to shallops of less than a hundred tons, the boats being sold for the price of the wood at their destination because the return up the river had to be effected by human or animal transport. With the rise of American trade it decayed, but was saved from complete ruin by Napoleon's use of it as an *entrepôt*. From 1825 goods and passengers were frequently carried downstream, but in 1840 the engineer Tulla levelled the bed of the Rhine above it. Far from benefiting Strasbourg, this increased the speed to such a degree that boats could hardly get upstream to that town, and, in any case, the river route could not have competed with the railways. All Rhine navigation ceased above Mannheim.

When Strasbourg was no longer French something had to be done to improve its position, and discussion wavered

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between a lateral canal and alterations to the river. In the end docks were built at the terminus of the Rhine-Marne and Rhine-Rhône canals, and in spite of the silt, which made constant dredging necessary, Strasbourg became, and has remained, the head of navigation on the Rhine, though smaller barges were able to reach Basel.

In spite of the objections raised by Bremen and Hamburg, and of the obstacles put in the way by the military authorities, more docks were opened and a lateral canal was begun. The tonnage using the port rapidly increased, and in 1913 the Rhine docks carried about two million and the canals more than three-quarters of a million tons of goods. More than half of the total traffic consists of coal, but recently petroleum has become important.

The Germans endeavoured to establish a port at Kehl, on the opposite shore of the Rhine, but the inertia of Köln (Cologne) and the absence of an industrial hinterland in Baden has prevented any great development. Since the War Kehl and a number of villages in Baden have been held by the French, and further development has been checked. The development of nearly 1,000,000 horse-power by the hydro-electric stations on the Canal d'Alsace will enable Strasbourg to begin large-scale manufacturing industries, and as the dams will reduce the speed of the current between Strasbourg and Basel from nearly three metres per second to about half a metre per second, Basel will tend to become the absolute limit of barge navigation. This will not affect the French traffic, but it will stimulate the manufacturing capacity of Switzerland.

Mulhouse (99,000 inhabitants) is strategically important, as it covers the Col de Bussay and the Trouée de Belfort, but its chief value is as the industrial centre of the textile industry. Most of the other Alsatian towns have a military value far greater than their commercial importance. Neu Breisach (3000 inhabitants) is the bridgehead defending the Rhine crossing between Colmar and Freiburg. As it is intended to generate nearly 100,000 electrical horse-power at this point, the town will probably develop hydro-electric industries.

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4. The Ardennes ("Ardenne")

The word 'ardenne' is a Celtic word which combines the idea of relief with that of woodland (*cf.* 'hardt' and 'wald'). The Ardennes is an old plateau which rises to between 1200 and 1500 feet above sea-level. Its altitude makes the climate both cold and damp (*cf.* Central Wales, the Cumbrians, and the Highlands of Scotland). The plateau resembles Central Wales in the ancient character of its rocks, and in its slopes being clothed in woodland. The level stretches are covered with grass and heath used as pasture for sheep and for the wiry Ardennes breeds of cattle and horses. The valleys are deeply trenched, and their climate is consequently much warmer than that of the plateau. The forests which fill the valley slopes are dense and possess a certain amount of commercial timber, while wherever there is any considerable depth of soil cultivation is carried on. The existence of iron ores, especially in the Jurassic rocks which form the southern fringe of the plateau, has given rise to iron industries—*e.g.*, at Mézières-Charleville, where large modern iron- and steel-works have been erected.

The Meuse enters the Primary plateau at Charleville. Here the valley narrows between wooded slopes. Old river terraces covered with ancient alluvium mark at different heights the various phases of erosion. Above a height of from 800 to 1000 feet the plateau is level, and is described by Michelet as "an endless forest of little trees." The streams form deep meanders on the alluvium and on the bends there are isolated towns—*e.g.*, at Revin. These towns still depend on blacksmith husbandry, as in the past. Castle-towns dominate both the northern and southern outlets of the gorges—*e.g.*, at Philippeville and Mézières, and in Belgium at Namur and Chimay. Over the whole of the Ardennes is the same poor infertile soil, the same disagreeable climate, the same difficulty of communications. Small cattle, horses, and sheep and crops of rye are the bases of agriculture, and the population throughout is scanty. The chief function of the Ardennes is that it separates peoples and climatic sub-regions, and so helps to individualize the districts which form its borders.

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Like the Welsh uplands and the central plateau of France, it is a region of emigration, and, like them, it has offered a refuge for racial types which have practically lost their identity in the lowlands.

Toward the west the Ardennes loses its individuality. The sombre wooded line sinks beyond Hirson under a covering of clay, and there is a gradual transition toward the lowlands. The slightly broken relief is, however, continued as far as the Sambre, but beyond this river the region passes almost imperceptibly into isolated sandy hills, which finally disappear in the low plains.

CHAPTER V

FRANCE: THE NORTHERN PLAIN

THE plain of Northern France is bounded on the north by the artificial frontier of Belgium, and on the south by the north-west-south-east ridge of the *collines* of Artois, which forms the edge of the Paris basin. On the east lies the Ardennes, on the west the North Sea. During the Tertiary period the area between the hills of Artois and the Ardennes was a shallow gulf. As a result the soils of French Flanders are composed largely of sand and clay, the lagoons having been gradually changed into marshes. These were subsequently drained, and the streams were regulated. The greater part of the former marshland is now under cultivation. The climate is wet and cloudy throughout the year, and although temperatures are generally equable, there are often several weeks of severe frost in winter and of sunny, hot weather in summer.

ECONOMIC SUB-REGIONS

1. French Flanders

French Flanders consists of the southern extremity of the plain of Flanders. It possesses several distinct physical subdivisions.

(a) The *Pevele* is the country which lies to the south of Ypres and Tournai, where mounds of gravel stand out above the low plain as wooded hills, such as Mont des Cats and Cassel. At the latter a layer of clay underlying the top layers of sand and gravel has furnished the hill with the supply of water needed by a fortified town. Thus Cassel became the centre toward which the Roman roads converged—*e.g.*, Steen Stræte. This district extends as far as Tournai and Douai.

(b) *The Clay Plain.* Clay is the characteristic subsoil of

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the greater part of Flanders. The surface slopes downward toward the north, but the dip of the strata is greater than the surface slope. As a result there is a gradual decrease in the amount of clay which appears at the surface, the more northerly formations consisting of sandy soils, which attain a very considerable thickness in the north of Belgium. North of Ypres and Courtrai the surface soils become poorer, and it is only as a result of great labour that the underlying clay soils have been raised to the surface to mix with the infertile sands. The countryside of Waes, between Ghent and Antwerp, presents the appearance of a large and prosperous garden at the present time, but this is due entirely to the centuries of patient toil of the inhabitants. Before the work was undertaken the north of Belgium was very similar in general appearance to the moors of the Campine.

Not only is the clay of Southern Flanders naturally fertile, but it is also coated in many parts with rich limons, which make cultivation both easy and profitable. In many parts, however, the land is marshy, and a large number of drainage ditches are required. During the War shell-fire destroyed the ditches, and a considerable area, even as far south as Armentières, became a morass. Since the close of hostilities the ancient drainage ditches have been restored, and crops of wheat, oats, roots, hops, chicory, flax, and hemp are again raised, and the numerous sugar refineries have been rebuilt in the midst of the beet-fields.

(c) *The Polders*. The region of polders and dikes begins at Bergues and stretches toward Furnes, Dunkirk (Dunkerque), and Gravelines. The slope between the clay plain and the polders was wooded before the War, and plantations of young trees have been made to replace those destroyed by gunfire. It must be remembered that it was in this neighbourhood that the most intense fighting took place, and wherever the tide of battle flowed the destruction of man's handiwork was practically complete.

Alluvial soils stretch from Jutland to Calais along the coast of the North Sea, and throughout the greater part of this area they are protected on the seaward side by a line of sand-dunes behind which the rivers slow down or stop alto-

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gether. The silt brought down is skilfully used in building up polders in the marshes (*cf.* the Broads and Fens and the warp-lands of the Humber). At the close of the Roman period the polders were overrun by the sea, and, as a result, there is hardly a trace of the Roman occupation in the low-lying districts. Marshy regions, where there is too much water in the soil for grains and roots, can be utilized most profitably as cattle pastures, and the pastoral farm is the unit of life in the polder districts. There are practically no towns of any size, though of recent years there has been a considerable development of dairy production, because of the nearness of the important and densely populated district of the North French coalfield.

(*d*) *The Dune Coast.* There is little to support life on the dunes, except at the gaps through which the rivers find their way into the North Sea. Here fishing villages are sheltered, though their principal source of income at the present day is the summer visitor who enters the dunes at either Calais or Dunkirk.

Flanders has always been a land of transit, and especially so in the wide trough which extends from Aire to Armentières, and is continued as a broad valley toward Ghent and Antwerp. This natural line of communications brought the rich plains of the south of Flanders into easy contact with the urban areas of Ghent and Bruges, whose command of routes made it worth while to transform sterile lands into densely populated agricultural farms, supplying the even more densely populated industrial centres.

The need for food in the northern towns stimulated agricultural production in the south, and the lands of Tournai, La Pevele, Lille, Béthune, Hazebrouck, Bergues, and even Artois became the natural granaries of the industrial centres of the north. Cereals are still the chief product of the clay plains, and the marketing of agricultural produce is still carried out in the ancient towns of Douai, Tournai, Lille, Béthune, Saint-Omer, and Bergues. It was not until the nineteenth century that the older cities, such as Tournai, lost their lead as manufacturing centres. With the development of the coalfield the tendency has been for the industries

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of the older towns to take a more specialized form—*e.g.*, in the metal and textile industries. While the newer towns on the coalfield have developed large-scale manufactures the older centres have been stimulated to new activity by the nearness of cheap coal, and though its industries have assumed a specialized character the Lille-Roubaix-Tourcoing district remains the first industrial region of France outside Paris. Roubaix (117,000 inhabitants) is the principal woollen market, Tourcoing (81,000 inhabitants) the centre for manufactured cottons, and Armentières the great linen market for the whole of France. In addition to these textile industries Lille (201,000 inhabitants) specializes also in metal and engineering manufactures.

2. The North French Coalfield

The Franco-Belgian coalfield extends from Fléchinelle and Béthune to Liège and the Dutch end of the Ardennes. The surface throughout is similar to that of Hainaut in that it consists of chalky plateaux, covered in parts with fertile limon, and broken into separate parts by damp valleys, which provide an abundance of cereals, beetroot, and orchard fruits as well as pasturage for cattle.

The principal advantages possessed by the coalfield are: (i) its low relief and slow, navigable rivers facilitate the construction of canals and railways; (ii) the local abundance of primary products—cereals, flax, beet, and wool—encourages the development of important manufactures; and (iii) the nearness of the sea allows cheap import on a large scale of such raw materials as cotton and wool. On the other hand, coal is difficult to work, and the cost of production is relatively high.

Though the coal lies below chalk the pits are not waterlogged, owing to a bed of impermeable clay between the coal and the chalk. Fracturing and folding render mining operations expensive, and as the coal measures have been overthrust from the south the borings have to penetrate not only the chalk, but also Devonian and Silurian rocks before they reach the coal. During the War a large number of mines

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were damaged, and at the time of the Armistice were practically useless. Since 1919 the pits have been repaired and modernized, so that production has now practically reached pre-War level.

The output of the mines of Pas-de-Calais and the Nord amounted to 29,500,000 tons in 1914, about 70-75 per cent. of the total output of France. The Belgian part of the coal-field produced about 30,000,000 tons, but though these mines

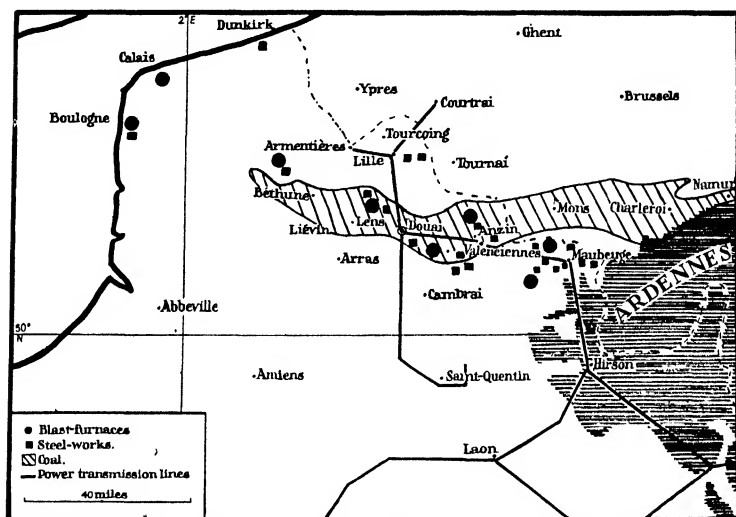


FIG. 16. THE NORTH FRENCH COALFIELD

were practically undamaged the Belgian mines in the battle zone did not recover as quickly as those of North France, where the output had dropped to 9,700,000 tons in 1920. By 1924 the output of the North French mining area was equal to about four-fifths of that of 1913, and at the present time is practically equal to that of pre-War years.

The War left France with a great shortage of labour, especially in the mining industries, where living conditions are not as good as in the best agricultural districts and in the manufacturing centres. This shortage has been made up

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by immigrants from other countries, and at the present time out of a total of 308,000 miners employed nearly one-third are of foreign birth. At least 70,000 of the miners in France are Poles. Though the chief importance of the North French coalfield lies in its supplying the Paris basin with coal by the Oise and by the numerous canals, especially from Lens, Anzin, and Denain, there are many important industries localized on the coalfield. North France possesses the chief supplies of coking coal, and in 1913 about 4,000,000 tons of coke were produced, chiefly in the northern coalfield. The old-fashioned ovens have been replaced by modern by-product ovens, but even with these the addition of the former German iron-ore districts makes France increasingly dependent on foreign supplies of blast-furnace coke. In 1913 the French iron industry needed only 3,000,000 tons of foreign coke, but by 1924 this amount had increased to 5,400,000 tons, of which 4,500,000 tons were obtained from Germany, smaller quantities being taken from Belgium, Holland, and Britain. By 1923 French production of coke had increased to 4,300,000 tons, chiefly obtained from Northern France. The restoration of the collieries of the devastated areas has increased France's capacity for the production of such by-products as ammonium sulphate and benzol, while patent fuel is also manufactured.

There are twenty blast-furnaces, but these have not yet recovered their pre-War importance, because of the competition of the better-equipped works of Lorraine. The chief blast-furnaces are near Calais (71,000 inhabitants), Anzin, Denain, Boulogne (53,000 inhabitants), and Valenciennes, and, on the Sambre, between Landrecies and Maubeuge. The iron ore has to be brought from other districts—*e.g.*, Lorraine and Normandy—the output of pig-iron in the north in 1925 being only 719,000 tons, less than $8\frac{1}{2}$ per cent. of the total output of France. The manufacture of steel is more important than the blast-furnace industry, nearly half the output being obtained by the open-hearth process, which requires considerable amounts of scrap iron, of which large quantities were collected from the battle-fields. The chief steel-works are situated in the upper

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valley of the Sambre, in the neighbourhood of Maubeuge (*cf.* Charleroi). This district possesses easy communications with the North French coalfield, with Lorraine, and, along the Sambre-Meuse, with the great steel-manufacturing districts of Belgium. Other steel-works are in the Anzin-Douai-Valenciennes district, and there are others at Lens, Lille, near Roubaix, Boulogne, Aire, and Dunkirk. The steel-works of the north specialize in castings and tubes, while round Valenciennes and Douai there are other metallurgical and engineering industries—*e.g.*, locomotives and machinery. The total output of steel in the north in 1926 was 909,000 tons, a little more than 12 per cent. of the French production for that year.

The greatest difference to be noted in the industrial condition of Northern France since the War is the great development of electrical power produced by utilizing the waste gases of the coke-ovens and blast and steel furnaces. Many new electrical power-stations have been constructed, the electricity being relayed through Saint-Quentin, Noyon, Laon, and Reims to within a few miles of Paris, and through Hirson and Mohon to the great iron district of Lorraine, where the electrical power cables are linked up with the central power-stations at Nancy and La Houve. This widespread electrification has largely increased the manufacturing capacity of Northern France.

Hainaut and Cambrésis. These districts form the somewhat higher areas on the borders of the chalk plateau of the Paris basin. Though the subsoil is similar to that of Belgian Hainaut, there is less limon on the surface than is general in Southern Belgium. Several areas, such as Mormal, are, however, covered with clay, and in consequence are forested. Elsewhere the plateau districts are grasslands, with fields of wheat and beet on the infrequent limon. The local pastures and the ease with which the local supplies of wool could be supplemented with wool brought from England, Flanders, and the Ardennes gave rise to woollen-manufacturing at an early date. The woollen industry extends from Fourmies to Avesnes and Hirson. Cambrésis is a flourishing tulle-manufacturing region, the cotton being imported through Calais

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and Dunkirk. Near Maubeuge coal is within easy distance, and the ancient iron industry of the western Ardennes has developed into a large-scale metallurgical business in the upper Sambre valley. Cambrésis and Hainaut command an important route from the Paris basin to Belgium through a treeless depression, the "Trouée de l'Oise." Cambrai, which manufactures textiles, and Maubeuge, which possesses important steel-works, are the principal towns.

COMMUNICATIONS OF THE NORTHERN PLAIN

The plain of Northern France forms the western limit of the great European plain, and has been the principal route followed by the great invasions of historical times. Its first roads were built by the Romans, and these have been added to and renewed by a long succession of French military engineers of later centuries. During the nineteenth century the great railway routes in avoiding the Ardennes crowded into the narrow plain between Calais and Maubeuge. The intercrossing of these railways has given rise to the important railway junctions of Saint-Omer, Hazebrouck, Lille, Cambrai, Valenciennes, and Maubeuge.

It is to the navigable waterways, however, that the region owes its early lead in the development of manufactures based on power-looms. At the beginning of the nineteenth century the canals and rivers were used for the transport of butter, cheese, and farm produce and for the retting of the flax used in the linen industry, of which this was the principal centre. The improvement of this system of waterways has kept pace with the development of industry, and at the present time the canals of the north have the greatest traffic of all the waterways of France.

The maintenance of inland navigation is essential to the economic prosperity of these manufacturing districts, and also, to some extent, to that of the Paris basin. The canals link the ports of Nieuport, Dunkirk, Gravelines, and Calais with each of the navigable headstreams of the Escaut, being continued through Cambrai and Saint-Quentin with the Somme and the upper Oise, which in turn is connected with

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the upper valley of the Sambre and the industrial towns of the Meuse. Moreover, there is a through connexion with the Aisne and the upper Meuse by the Canal des Ardennes, though this is somewhat roundabout and tedious. The busiest sections of the canal system are the High Deûle (5,000,000 tons per annum), the La Bassée Canal (3,500,000 tons), and the Sensée (2,000,000 tons).

Inland ports have grown up for the export of coal to the

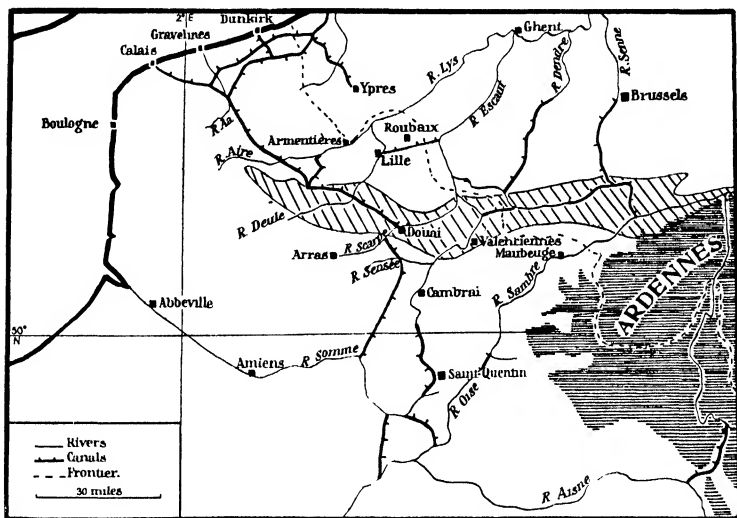


FIG. 17. MAP OF THE NAVIGABLE WATERWAYS OF NORTHERN FRANCE

Paris basin and for the distribution of the Scandinavian timber and ore, Spanish ore and fruit, American oil and cotton, Icelandic fish, Baltic flax, and wool from the Argentine and Australia. Dunkirk (3,500,000 tons) is the ocean port for the import of raw materials, though the distribution of manufactured goods is often carried out through other centres. Pont-à-Vendrin, on the Deûle, has more than 1,000,000 tons of water-borne traffic each year, while Denain and Béthune have an annual traffic of about 800,000 tons. Even Lille has 700,000 tons of canal traffic.

CHAPTER VI

FRANCE : THE PARIS BASIN

A NUMBER of characteristics are common to the Hampshire, London, Flanders, and Paris basins. In each case a down-fold of chalk forms the main geological feature, and the chalk is covered by Tertiary deposits, partly fresh-water and partly marine. In the case of the Paris basin, however, the down-fold is almost circular in plan, and open to the sea only along the English Channel. The result is that the escarpments form ridges facing outward from the centre of the basin, while the dip slopes give easy communications within the circular ridges. Thus the region forms a naturally defensive unit, and at an early date became the political nucleus of the French state.

The resemblance between the parts of the great European plain which lie in the north and west of France and those of the south of England should be noted. The north-west of France is an area of old hard rocks which resemble those of Cornwall and Devon. Both peninsulas are regions of heavy rainfall, with cattle-raising and dairy-farming as typical pursuits. In each case the population is confined to the valleys, while the indented coasts make good harbours, though their remoteness from metropolitan centres makes these more important as naval bases and fishing stations than as commercial ports. The east of Northern France is somewhat drier than South-east England, so that the vine appears in the neighbourhood of Reims. Both areas, however, are important for wheat, oats, and sugar-beet.

The London basin may be distinguished from that of Paris by the fact that at least half the area lying within the chalk ring is composed of clay, and there are no marked Tertiary escarpments whose steep-wooded slopes form such a characteristic feature of the region round Paris. On the whole, the climate of the Paris basin is transitional, between that

THE PARIS BASIN

of the English Channel and the semi-continental conditions of the Lorraine plateau. It is to its diversities of surface soils

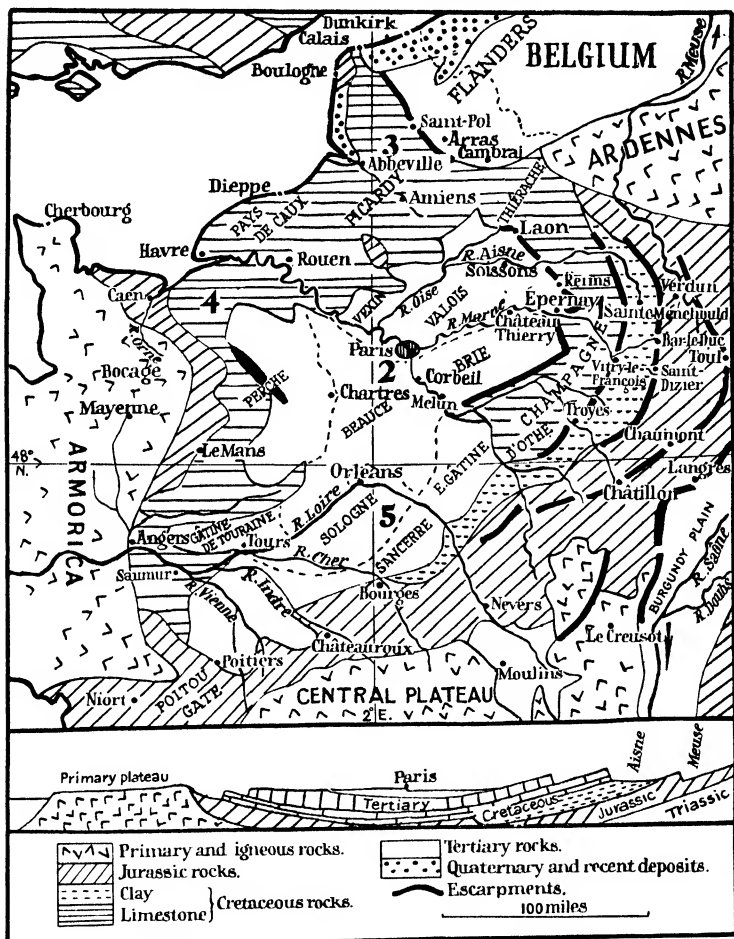


FIG. 18. THE PARIS BASIN

that the principal differences in cultivation are due, and not to any considerable differences in climatic conditions. The narrow belt of lower chalk in the east is chiefly composed of

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somewhat infertile sands and impermeable clays, while the broader outcrop of upper chalk in the west is even less fertile. Unlike the ridges which characterize the south-eastern counties of England, the chalk areas of the Paris basin have very gentle dip slopes, so that they appear as plains rather than as hills.

Outside the chalk, on the east, are ridges of Jurassic rocks similar to those of the Oolitic scarps of England. In the east the Oolite hills of Barrois border Lorraine, and are continued in the north by the hills of the Argonne, which are higher and less broken. Within the chalk the *Falaise d'Ile-de-France* consists of Tertiary limestones, which form the heart of the Paris basin. As these limestones are harder than the chalk of Champagne the escarpments formed by them are steep cliffs, which provide caverns for the wine industry and shelter the vineyards from the rain-bearing winds of the west.

Five subdivisions of the Paris basin may be distinguished.

I. CHAMPAGNE AND THE EAST

(a) The *hills of Barrois and the Argonne* are formed by the Oolite and lower chalk, the eastern slopes of the chalk of Barrois being occupied by vines and the western slopes by woodlands. The soil of the Argonne is less permeable, and there is a good deal of forest. The chief market towns are Sainte-Ménéhould and the route-centre, Bar-le-Duc.

(b) '*Wet*' *Champagne* consists of heavy clays, and is occupied by woods and marshes. Like the eastern edges of the Paris basin, it is scantily peopled, and it is only in the alluvial valleys that wheat is grown—*e.g.*, round Brienne, on the Aube, Perthois, on the Marne, and Vouziers, in the Aisne valley. Between the Aube and the Marne, in the Vallage, are bands of clay containing iron. The iron-smelting of an early date has left behind certain hardware manufactures. There are also local timber and pottery industries.

(c) '*Dry*' *Champagne* is a large plateau of porous chalk, which in its natural state is covered with dry pastures suitable for sheep. Its alluvial valleys are cultivated and the



FIG. 19. AN AERIAL VIEW OF PARIS
Aerofilms, Ltd.

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hill slopes are planted with pines in order to collect humus and fit the slopes for cultivation. The valleys provide easy ways of communication which concentrate on Paris. In early days the hill pastures gave rise to local woollen industries (*cf.* Winchester and Reims), and there are now cotton and hosiery manufactures—*e.g.*, at Troyes (58,000 inhabitants), the chief centre.

(*d*) *La Falaise* is a scarp of Tertiary limestone which separates Brie and Champagne. The scarp slope faces east and south-east, and gives dry, hot conditions in summer, which enable the vine to be grown. (*Cf.* Dinant, in Belgium, where the vineyards have been abandoned.) Special methods are used to convert the wine into 'champagne,' which is stored in underground caverns. The wine centres are Épernay, Vertus, and Reims (101,000 inhabitants), the latter being the centre of an ancient woollen industry.

(*e*) *The Yonne and Aisne Valleys.* Between the Seine and the Yonne, Le Pays d'Othe is a clay region which is well wooded. This is continued toward the Falaise escarpment on the north and toward Burgundy on the south-east. The river carries the timber of Morvan and the building stone of Auxerre and Sens to Paris. On the north of Reims the chalk plain is traversed by the Seine. Here the rainfall is heavier, and the vineyards of the eastern slopes are replaced by cultivated fields and market-gardens. In places the surface is covered by fertile limons, where fields of sugar-beet replace sheep pastures. The district of Craonne and Laon is intermediate in character between the poor pastoral district of Champagne and the rich agricultural region of Picardy.

2. PARIS AND THE CENTRE OF THE PARIS BASIN

The region round Paris consists of a series of plateaux inclined toward the centre. The soils are mostly Tertiary limestones, which are extremely fertile where they are covered by limons, but less fertile where the surface consists of sands. As a rule the limons are under wheat and the

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sands under woods. Thus Brie and Beauce, like Picardy in the north, are important producers of cereals, except in the clay districts, which are pastoral. The river valleys provide natural routes to the capital, and their alluvial soils are used for market-gardens and orchards.

(a) The *Oise valley* lies to the north of Paris. With its tributary, the Aisne, the Oise flows through a country of limestones, sands, and clays. In the Soissons-Compiègne-Noyon district, in the north, these are coated with limons, but in the Oise valley, nearer Paris, the soils are somewhat less fertile. Though not as productive as Brie and Beauce, on the south of Paris, the north is well cultivated, especially in the valleys of the Aisne, where market-gardens are important. The Aisne forms a natural route from Picardy to Champagne, and is connected by the Canal des Ardennes to the Meuse near Sedan.

(b) The *Ile-de-France*, the district immediately surrounding Paris, is largely under market-gardens, of which Paris itself is the principal market, though a considerable area is under glass and its produce exported to London.

Paris (3,000,000 inhabitants) is the natural centre of the Paris basin, the exact site being chosen by the Romans because the existence of an island in the Seine at a point where relatively high land approached the river at both sides facilitated the crossing. Even before Roman times the site had proved of value, and during the centuries which followed the Roman occupation Paris became the most important bridge-town in Europe, because it was the focus of all the routes into France from the North European plain both round and through the Ardennes. Here also the route between the north-west of Europe and the Mediterranean crossed the route between Central Europe and the Atlantic coastlands. It became an important local market because of the fertility of the surrounding country. It was easy to defend on account of the surrounding hills, which also provided stone for its walls. It was not only a local administrative centre, but was also the head of ocean navigation, and still possesses a considerable overseas trade. The great variety of products of the Paris basin made Paris self-sup-

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porting, and its economic stability enabled it to become the capital of France. As the centre of a great Court it attracted numerous manufactures, especially those of the luxury type, such as silks (now represented by gold and silver cloths and embroideries), and became, and is still, the world's centre of fashion and art. Its development as a great centre of modern industries came late, and was due to the development of navigable waterways and railways which link it with every part of France. Paris is even more important as a commercial centre concerned with the financing of industry and trade in every part of Europe and in the French dominions overseas. It is also probably the most important tourist centre in the world.

(c) *Brie*, the district which occupies the dip slope from the Falaise escarpment between the Marne and the Seine, is extremely fertile. The drier parts are under cereals and the damper areas under grass. Similar conditions are found in Beauce, to the west of the Seine. Chartres, on the Eure, is the chief town. Beauce and Brie are the granary of Paris, the flour-mills being situated on the Seine, at Melun and Corbeil. Nearer Paris the sands of Fontainebleau and Rambouillet are forested and are used as pleasure resorts.

3. PICARDY AND THE NORTH OF THE PARIS BASIN

The limons that cover the chalk plateau render Picardy much more fertile than Champagne. The region is cultivated throughout, oats and barley being more important in the west and wheat and beet in the east. Flax is grown in the river valleys, but is declining in importance. Along the Channel coast the damp climate gives pasture on which milch cattle are kept. It furnishes the industrial region of the north with foodstuffs. The chief markets are Arras and Saint-Pol, which command routes leading into the North French coalfield. Near Boulogne a small clay plain is a continuation of the Weald, its low coastline consisting of banks of gravel and sand, at times resembling the dunes and at others the pebble beach of Pevensy. As in the case of the

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marshlands of the English coast, sheep are reared. Boulogne (53,000 inhabitants) is an important cross-Channel port, and has the largest of the French fishing fleets. The amount of clay which overlies the surface of the chalk increases in Thiérache, the district of the upper valleys of the Oise, Sambre, and Scheldt. Here the plateau clay is not semi-porous, as in the limon-covered parts of Picardy and Santerre, but forms meadowland, with slow, marshy streams, which provide the osiers for local basket industries. The chief importance of 'La Thiérache' is due to its being the easiest line of communication between the Paris basin and the valleys of the Sambre and Escaut. The sources of the Somme and the Escaut are less than eight miles apart, and the watershed forms one of the most important lines of communication in history. From Vermand, near the source of the Somme, to Bavay the Roman road to Cologne can still be traced for a considerable distance. Since the marshes of Thiérache have been drained the main route has passed through Saint-Quentin, Le Catelet, and Maubeuge. At the present time this district is the easiest route by which France can be invaded from Germany, because there are no escarpments such as those which form defensive ramparts in the east of the Paris basin and in Artois. During the recent War Britain's chief military efforts were the defence of the hills of Artois, to protect the Channel ports, and the struggle for the possession of the country between Arras and Saint-Quentin, in order to defend Paris. For many years this region will remain a pilgrimage centre.

Thiérache is mainly pastoral country, but to the west, in Santerre, the clay of the plateau is sufficiently permeable to allow the surface waters to drain away. These plateau clays are known as 'limons,' and produce excellent crops of wheat, beet, and fodder grains. The houses are often built on flint foundations, and are held together with frameworks made of timber. The great problem, however, is that of water-supply, and wells have to be dug to a depth of several hundred feet before water is reached. The villages are sometimes placed where a small area of more impermeable clay offers a small local water-supply and favours the growth

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of trees, but these villages are becoming less important as the rural hand industries decay and the operations of the farms require less hand labour. In the plateaux, where the surface consists largely of chalk, there are few scattered farms, and practically the whole of the farming population lives in villages which cluster round the artesian wells. In the valleys of the chalk the villages lie along the belts of springs which drain from the chalk (compare the chalk regions of England).

The Somme is a wide, marshy valley which has been occupied by man since the Old Stone Age. Like similar valleys in Southern England, it no longer carries down large loads of gravel, but exhibits many of the main characteristics of a very old stream. Its valley is much too wide for the volume of water which it carries, and it has raised its channel above the general level of the sides of the valley, where there are flood channels. In many parts there are numerous regulated channels in which little islands are converted into market-gardens, to which the workmen go by boats. Towns are naturally at the points where the river can be crossed. Thus Amiens, the limit of the tides in early times, was the lowest point where the Somme could be crossed. As at Gloucester, on the Severn, the Romans chose as their crossing-point a place where the Somme split up into a number of channels which could be easily bridged, and where a slight hill gave firm ground for a fortress in the middle of the valley. For many centuries the line of the Somme was the defensive frontier of France (*cf.* the Severn), and the modern citadel has been built on the edge of the plateau on the north of the river.

Amiens (92,000 inhabitants), the lowest bridge-town of the Somme in early times, was also the centre of river- and road-routes in Picardy. By regulating the channels of the Somme it developed sufficient water-power for considerable woollen and linen industries, and toward the end of the eighteenth century became the principal cotton-manufacturing centre in France, specializing in the production of cotton velvets for the Spanish market. Its satin, canvas, and upholstering cloths are still important, though the chief

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source of power in its mills is coal obtained from both the North French coalfield and from England. South of the Somme Bray and Beauvais occupy a clay plain surrounded by chalk hills. The clay is too heavy for the cultivation of cereals, and the meadows are used for dairy-farming, the cheese and butter being marketed in Beauvais.

The coast of Picardy has a number of small fishing-ports, such as Étaples. During recent years several places, such as Le Touquet, have become fashionable watering-places. The only important commercial centre between Boulogne and Dieppe is Abbeville, the lowest bridge-town on the Somme, though only very small coasting-vessels of 150 tons can reach it from the sea. It has linen and woollen industries, its carpets being well known in former times.

4. NORMANDY AND THE WEST OF THE PARIS BASIN

The climate of the west of the Paris basin is maritime, and a great part of the year is cloudy and damp. Normandy extends beyond the border of the chalk across the Jurassic Campagne de Caen into the Primary and igneous plateaux of the Bocage Normand and the Cotentin peninsula. Eastern Normandy consists of a high chalk plateau broken by the steep gorge of the Seine valley, which forms a route of so much importance that it contains practically all the towns and villages in an otherwise monotonous region of wheat and sheep. It is only in the valleys that dairy produce becomes really important, but in the Vexin Normand, which is somewhat lower than the Pays de Caux, flax, colza, and sugar-beet are cultivated. South of the Seine the lower plateaux of Lieuvin and Neubourg, with deep limons, produce fine crops of wheat, and the low-lying coast-lands of the Pays d'Auge, with a mild and damp climate throughout the year, produce cider and cheese in large quantities. Similar conditions in the Lias clay depression of the Bessin give rise to the dairy-farming near Bayeux, Isigny specializing in butter. There are a number of places, such as Honfleur,

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Trouville, Deauville, and Cabourg, which have an important summer tourist traffic.

Farther west the Contentin peninsula is a region of Lower Primary rocks, and, strictly speaking, belongs to the Armorican region. As in Devon, cattle are reared both for meat and for milk, and there are numerous apple orchards. The population, however, is scanty, and the only important town is the Atlantic port of Cherbourg. In the region immediately round Paris the Seine is not deeply embanked, but on entering the chalk country the river follows a deep trench, which does not open out until it reaches Quillebeuf, near its mouth. The tides cease at Rouen (123,000 inhabitants), where an island in the river enabled the Romans to carry their road from Chartres across the Seine to join the road from Troyes to Harfleur. As the country to the north was scantily populated there was no important route through the Pays de Caux, and Rouen remained a small port until the landing of the Northmen on what Vidal de la Blache describes as the "Saxon shore" of the Caen region.

The little sheltered harbours of the Calvados lead to fertile country, and the early capital of the Normans was Caen. From this centre easy routes lead to Orléans and the Loire, through valleys which offered opportunities for agriculture, and thus facilitated the continuous expansion of Norman power. As in the case of York, Rouen was an outpost of Roman power, and, being the lowest bridge-town, became the chief outlet of the Seine valley throughout the Middle Ages. As it linked different regions, the sheep pastures of the north, the cattle and orchard country of the west, and the grain-lands nearer Paris, Rouen also became a great agricultural market. Its command of raw materials and of the surplus labour which is always to be found in the neighbourhood of a great port and military centre led to the development of simple woollen manufactures, while the existence of impermeable clays on the edges of the plateau gave the water-power and timber needed for the expansion of its textile industries in more modern times. Rouen is the centre of numerous small valleys whose villages still employ water-power in woollen and, more especially, in cotton manufac-

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tures. Rouen is still the port of Paris, American petroleum, English coal, Algerian wine, and Scandinavian timber being landed there for transshipment in barges to the upper Seine. Le Havre (158,000 inhabitants), the principal Atlantic port, is the successor of Harfleur, the medieval port on the little Lézarde river, which is now silted up. Before the rise of Havre Harfleur was the chief port of the Seine mouth, with a considerable trade in wool from Spain, Portugal, and England. With the silting up of its harbour a new port was built at Havre, behind which the chalk hills provided excellent positions for forts from which the Seine mouth could be defended. The rise of American trade made Havre the chief cotton-importing port for North France, Troyes, and Mulhouse. Its West Indian trade made it an *entrepôt* for coffee, cocoa, and spices. It is Europe's chief coffee market, and its excellent railway service makes it the chief outlet for the exports of Paris to the United States and Britain, though its position as a transatlantic passenger port is rivalled by Cherbourg.

The Iron Industry of Normandy

The iron ores of Normandy are still mined in the Bocage Normand, where Silurian downfolds have preserved hæmatite and iron carbonate in sufficient quantities to justify exploitation. There is evidence that the ores were used in pre-Roman times, but even in Roman times the mining was of a superficial character, and, as in the Forest of Dean, a great part of the iron was wasted, so that the slag of the ancient furnaces is often worth resmelting. Throughout the Middle Ages charcoal was used for smelting, and at a later date water-power was used to drive the bellows and hammers. Wherever the streams were not perennial the industry had a seasonal character, and the workmen went back to the farms during the three warm summer months when the water-supply was insufficient. Later, in spite of the opposition of the farmers, ponds were dug in order to ensure a continuous supply.

Toward the end of the eighteenth century France opened

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her markets to English iron, and many of the forges were closed down because they could not compete with the coke-smelted English iron. During the Napoleonic period English iron was excluded, and the Norman iron industry revived. In 1860, when English iron and steel were again admitted, the mining and smelting of iron ceased altogether, through the exhaustion of the superficial ore deposits and the depletion of the forests in the neighbourhood.

Toward the end of the nineteenth century valuable deposits were discovered at May, Hálouze, and La Ferrière, and foreign industrialists formed companies to mine and roast the ores to increase the iron content sufficiently to make export worth while. In 1914 more than half the iron-mines of Normandy were owned by Germans, and the output had risen to about 800,000 tons.

The War gave rise to a great shortage of iron ore in France because of the German occupation of French Lorraine, and the iron-mines were continued under French control, though it was difficult to obtain sufficient labour. The Peace Treaties gave France more iron than she could profitably develop, and in 1920 the output of the Norman mines was less than half that of 1913. There are two great difficulties which have not been removed. (i) The French peasant does not change his occupation readily, and prefers work on the land to work in the mine and forge. As the villages are scattered and the population of the Norman Bocage is scanty, the only labour available is that of the seasonal worker or of the foreign immigrant. The Norman

dislikes controlled labour and the discipline essential to organized industry; most of all he dislikes work underground. Though he has, in the past, supplied labour for quarries, open cast-iron workings, and shallow mines, this labour was, to a certain extent, seasonal, and did not differ materially from his work on the land. He was a miner by accident and only temporarily; but to work in the deep mines or at the smelting furnaces was a much bigger step which he declined to take. With a change of climate, of dwelling, above all of drink, he becomes restive. The lures of free passage, higher wages, and low rent cannot draw him. He will not change his way of life.

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Miners brought from the wine districts of the south could not accustom themselves to the cider; they returned home, paying their own fares. An attempt to obtain labour from the Pas-de-Calais met with a similar fate. Bretons come, it is true, but they come in bands, headed by their priest, and only remain so long as their customs are not interfered with.¹

The foreign labourers who are largely employed in the iron-mines come chiefly from Spain, Italy, Greece, and Poland, but they seldom settle permanently in France. (ii) Lack of sufficient capital has hitherto prevented French industrialists—who lack, moreover, the technical efficiency of the Germans—from making a commercial success of the Norman iron industry. Furnaces have, however, been erected at Caen, and pig-iron is exported in small quantities to Britain and Spain.

The ore exported from Caen is chiefly marketed in South Wales, Middlesbrough, Rotterdam, Emden, Glasgow, and Workington, the remaining 40 per cent. of the ore being sent by rail and by coasting-vessel to the North French coalfield, and especially to Anzin. It is improbable that the Caen iron industry will develop rapidly, as there is no possibility of balancing the coal imports with iron and iron ore exported, and there are no other commodities which the colliers could carry in return. This makes competition with North France and Germany almost impossible. The chief mines are at Halouze, La Ferrière, Larchamp, Saint-Rémy, and May, the ore being carried by railway along the Orne to Caen.

5. THE LOIRE AND THE SOUTH OF THE PARIS BASIN

The Loire basin extends from Morvan to the Armorican region which borders the Paris basin on the west. With its tributary, the Allier, the Loire rises in the central plateau, and flows northward from the narrow gorges of barren igneous rock into the small basins of Tertiary limestones and sands in Forez and Limagne. Both of the rivers have a rapid

¹ H. V. Janau, "The Iron Ores of Normandy," *Scottish Geographical Magazine*, September 1925.

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fall (one in two hundred), and their waters are subject to floods in autumn and spring. Even below Roanne navigation is only possible because of the construction of a lateral canal which is joined at Briare by a canal from the river Loing, which connects it with the Seine at Fontainebleau. The sands of Limagne and Forez are densely wooded, and the grasslands of the lower parts are used as pasture for cattle. The limestone is quarried. The industrial life of the valley is based on the coalfields of the plateau, and the cultivation of rye, barley, and oats is carried on. In the neighbourhood of the industrial districts sugar-beet is grown.

To the north of Roanne and Vichy the soils become finer. The valley opens out, and the surface is somewhat marshy, the chief occupation being the fattening of cattle bred in the hills. At Decize the Loire enters a more varied plain of Liassic marls, whose fertile humid soils are covered with rich pastures and woodlands. Here the cattle of Morvan are fattened for the Paris market. In the west, in the shadow of the hills, there are a number of vineyards. An ancient iron industry based on the local iron ores and charcoal is now concentrated in the valley of the Loire at Fourchambault, near the canal by which coal is now obtained.

Nevers (30,000 inhabitants), the chief town, is the outlet of this outlying district of the Paris basin. It commands routes leading to the Saône, Touraine, and Paris regions. It shares in the iron and steel industries of Charolais, Le Creusot, and Saint-Étienne, and was formerly important for porcelain and jewellery. Copper industries are carried on at Imphy. Moulins (20,000 inhabitants), on the Allier, owes its name to the great number of water-mills from which power was formerly derived on that river. Power is now obtained from the neighbouring coalfield, and is used to manufacture cutlery, silk, woollen, and cotton goods, wine, and wooden articles on a small scale.

Below Briare the Loire enters a well-marked depression, the Val d'Orléans, whose sides are clothed with vineyards. On both sides of the river alluvium the soils are relatively poor, especially on the south, where the poorly drained

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Sologne is partly covered with the granite *débris* of the central plateau. Numerous meres and marshes in this district are not yet drained, and cattle are still more important than the produce of the small fields of rye and buckwheat in the parts which have not been scientifically drained and fertilized. Until 1860, when systematic draining began, the Sologne was practically desert country, and the population is still scanty, less than sixty persons per square mile. The miserable conditions of the people can be gauged from the nature of the houses, many of which are still constructed of clay and timber, with roofs made of reeds, and have no windows. Farther south is the isolated plateau of Berry. Where the Jurassic limestones are covered with limons there are fields of wheat, but elsewhere the dryness of the surface gives sheep pastures. Here and there are found ancient traces of abandoned iron-workings. It is through this limestone district that the upper streams of the Cher, Indre, and Creuse make their way from the central plateau to the Loire, the Cher offering an almost direct route for the canal which connects Nevers with Bourges and Tours. Bourges (31,000 inhabitants) is the chief commercial centre of Berry, and is linked by canal and railway with the industrial district of Montluçon. It possesses small cutlery and woollen manufactures, and shares in the pottery industry of Sancerre and Puisaye.

On the north of the river the Forest of Orléans is a district where the limestone is covered with granite sands washed from the central plateau, but beyond this area lies one of the most fertile districts of France. This is the Beauce, which ranks with Brie as one of the chief wheat-producing areas. Orléans (71,000 inhabitants), at the bend in the Loire, is the natural meeting-place of routes leading to Paris from the central plateau and Aquitaine. It has been fortified since before Roman times, and throughout the Middle Ages was an important commercial centre, where the wine, vinegar, brandy, and vegetables of the alluvial vales, the timber of the forests which line the northern banks of the rivers, and the cattle and wool of the south were marketed. Its woollen industry attracted cotton, and it has important hosiery-works.

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Below Orléans the Loire is almost unnavigable during the dry season, and splits up into numerous channels. Toward Tours the valley widens, and the alluvial soils which form its banks produce large crops of cereals and fruits, while the river terraces are covered with vineyards. The valleys of the Cher, Indre, and Vienne exhibit similar characteristics, and the district between Tours and the Val d'Anjou is known as the "Garden of France." By contrast, the surrounding plateaux, the Gâtine de Touraine and the plateau of Sainte-Maure, are sandy and almost uninhabited.

The valleys of the Loire converge on the main river between Tours and Angers. Rich in prehistoric remains, it is certain that the Varennes district below Tours has been occupied since a very early period. The convergence of the routes led to the creation of fortified towns at Tours and Saumur, where islands in the river facilitated the construction of bridges. Tours (77,000 inhabitants) was in existence as a tribal centre before Gaul was conquered by Rome, and became the ecclesiastical centre of France at a very early date. Its frontier position between the Franks of the Paris basin and the Romanized Gauls caused it to continue as a fortified forward post of the French against the people of Aquitaine, and it grew rich on the proceeds of its pilgrim traffic. The fertility of the "Garden of France" made it possible for the town to grow unchecked during the Middle Ages, and it was a favourite town of the Kings of France. During the fifteenth century Italian workmen were encouraged by the Court and the Church to establish the manufacture of silks, and it remained the principal seat of the French silk industry, Lyons being merely an *entrepôt* for the distribution of raw silk. It was not until 1536 that the manufacture of silk was authorized at Lyons, where there was an unrestricted market for labour (*cf.* the rivalry of Coventry, a royal borough, and Birmingham). In 1562 the cathedral was pillaged by the Huguenots, but it was not until the Revocation of the Edict of Nantes that the silk industry was ruined and the population, estimated at 80,000, halved. The small industries which remain to testify to its former greatness, when it enjoyed the patronage of both Church

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and State, are the manufacture of tapestry, glass, and clocks. Its chief industry is the printing of books.

The Mayenne and Sarthe drain the regions of Anjou and Maine, the west being granite uplands and the east relatively infertile Jurassic and Tertiary plateaux. In both parts there is still a good deal of wooded country, with orchards and pastures. The granite uplands are poor, and small manufactures of linen and cotton are carried on in Laval and the small towns of the Mayenne. At the confluence of the Sarthe and the Huisne Le Mans (73,000 inhabitants) is the principal market for the grain, apples, and poultry of Maine and Perche. South of Le Mans the soil consists of chalk largely covered by river alluvium, which gives rich crops of wheat and other cereals. Early vegetables and grapes are important. At the junction of the Loire, Sarthe, and Mayenne, and near the main stream of the Loire, Angers (86,000 inhabitants) is the market for the slate, fruit, and cattle of the Mayenne valley and manufactures textiles and leather. It has an important trade in corn and wine. Below Angers the Loire breaks through the old rocks of the Armorican region and becomes navigable for ocean-going vessels at Nantes. Nantes (184,000 inhabitants), the lowest bridge-town, is the centre of three important districts, Anjou, Brittany, and Poitou, and was for a long time one of the principal ports for West Indian trade. The civil wars of La Vendée and the massacres within the town brought its industries to a standstill, while the loss of the French West Indies and the increasing size of ships caused a great decline in its overseas trade. Nevertheless, its ancient trade has left it with sugar-refining, coconut-oil, and cocoa manufactures, while the establishment of an outport at Saint-Nazaire (*cf.* Avonmouth and Bristol) has led to the creation of metallurgical and shipbuilding industries and to an *entrepôt* trade in timber, petroleum, and iron ore. Its purely local resources of fish and its garden produce (based to a certain extent on imported nitrates) have given rise to the manufacture of sauces. Poitou is the low limestone plateau which unites the Paris basin with Aquitaine. Its rich soils produce both cereals and vines. Its damp valleys are used as fattening

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grounds for the cattle raised in Vendée and Limousin. It possesses two markets, the capital, Poitiers, and Châtellerault, at the junction of the Clain and the Vienne. Both towns are centres for the trade in wine, dried fruits, and corn, while the latter also manufactures cutlery. Their present importance is due to their railway communications with Bordeaux and Paris.

CHAPTER VII

FRANCE : THE ARMORICAN PENINSULA

THERE are many points of comparison between the western peninsula of France and the south-western counties of England. Both Brittany and South-west England are isolated from the main parts of their respective countries and have formed the refuge of races which occupied England and France before the coming of the North European invaders who established new customs in Northern France and in the English plain. In both peninsulas, moreover, the surface consists of igneous or Primary rocks connected with the rest of their countries by belts of Jurassic rocks, which form the more densely populated agricultural areas. Elsewhere the inhabitants have been compelled to undertake mining, fishing, or manufacturing in addition to agriculture.

CLIMATE

In both regions the climate is equable and damp and there are similar local climates. (*a*) The coastal climates are the most equable, the annual mean temperature being about 51° F., while the annual and daily ranges are very small, being about 9° F. in Cornwall and 10° F. at Brest. The rainfall is well distributed throughout the year, being thirty-three inches annually at Brest and Torquay. In both vegetative growth is practically continuous throughout the year and killing frosts are infrequent. (*b*) The transitional climates of the parts which lie between the plateaux and the coasts are also similar in that their daily range is somewhat greater (15° F. in Cornwall), and the mean annual temperature is slightly lower than in the case of the coasts. In the heights which form the northern and southern parts of Brittany the climate is more extreme and wetter than it is in Cornwall. (*c*) The uplands of Cornwall and Devon and the interior of

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the plateau of Brittany have still lower temperatures and higher rainfall than the transitional regions, excepting the southern ridges of Brittany. (*d*) South-east Devon and L'Ouest (Vendée, Poitou, and Charente) have greater extremes between winter and summer; the mean annual temperature is 50° F. in Devon and 59° F. in Poitou. In both the rainfall is less (thirty inches) because each district lies in a rain-shadow area.

RELIEF AND COASTLINE

In both lands the coasts are highly indented and the interior is highland. The north-west of Cornwall and the Exmoor upland correspond with the granite ridges of Northern Brittany and the Bocage Normand. The central uplands of Cornwall and Devon, however, consist of granite, while the central part of Brittany forms a depression of Primary rocks which gives rise to two basins at Châteaulin and Rennes, separated by the plateau of Rohan. These inland basins have no counterpart in Cornwall or Devon. South Devon is a lowland region of Devonian rocks which is quite unlike the southern granite ridges of Brittany (Cornouaille, Vannetais, Nantais, and the Vendéean heights, or Gâtine). Both the east of Devon and Somerset and the east of Normandy, Anjou, and Maine consist of Secondary rocks, though Somerset contains also a zone of Carboniferous rocks in the neighbourhood of the Mendips and the Bristol coalfield.

It is clear therefore that both in South-west England and in the western peninsula of France there is a region of considerable difficulty, where arable soils are infrequent, and where a large part of the surface is covered with woodlands and moors. In such remote parts old methods of life linger, while there is constant emigration to other regions. The migration of the Bretons to the iron-mining districts of Normandy has already been noted. A considerable proportion of the coastal populations of both Cornwall and Brittany have been driven to a seafaring life. Fishing is still important both as a source of food and as a means of procuring the manure necessary to fertilize the poor soils of the coastal villages.

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The manufacturing industries are similar. Apple orchards are common to both, while dairy production, flower culture, and small manufactures take similar forms. The leather industry lingers in the glove trade of Yeovil and the manufacture of boots at Fougères. The hand-loom linen industry has given rise to cotton-spinning at Flers, Saint-Rémy, and Mayence, and woollen and lace industries are still carried on in Somerset and Devon. Both peninsulas were formerly forested, but in Cornwall, which was the chief source of European tin for many centuries after the Vilaine deposits were worked out, the forests have been cut down for smelting, so that even the export of pitprops from the north coast has ceased. Forests remained for many centuries as the frontier between Brittany and France, and wood is still used in some of the iron-mining centres instead of coal. Redruth, the centre of Cornish smelting, now uses nothing but coal.

Mining is still important in both regions, though there is a much greater variety of mineral products in Cornwall and Devon, for, whereas the minerals of Armorica now consist of iron ore, slate, and a few fragmentary deposits of coal, those of Cornwall include kaolin, wolfram, tin, copper, and arsenic, while during the War it was found to be worth while to extract the iron ores of Minehead. In South-west England mining is chiefly carried out to the west of Dartmoor, and though both tin and copper production have greatly declined the mines are by no means exhausted, and can sometimes be kept open by reason of the value of the secondary products, such as wolfram and arsenic. The kaolin output is sometimes as much as three-quarters of a million tons. In Armorica mining is chiefly carried on in the iron districts of the Orne and Mayenne valleys, though there are small coal-fields at Laval, Chalonnès, and Chantonnay. Slate is mined at Trélazé, in Anjou, the only other source of slates being the Ardennes.

THE COASTS OF BRITTANY—ARMOR

As in Devon, the coastal regions of Brittany carry on a more profitable kind of agriculture than is possible in the interior. The north coast shares in the dairy industry of Nor-

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mandy, while the fisheries and the holiday traffic give to this district a much denser population than is found elsewhere in Brittany. Unlike the valleys of Cornwall and Devon, many of the streams are used to produce power for local industries, though coal is imported for the cotton-mills of Flers, Condés-sur-Noireau, and La Ferté-Macé and the hemp industry of Sarthe and Maine-et-Loire. On the warmer south coast there are grain and cattle farms and sardine fisheries. It is relatively inaccessible, and has not developed any considerable tourist traffic. The west coast is also remote from the rest of France, and, though it has a considerable trade with Britain in early vegetables, is of little importance. Brest (68,000 inhabitants) resembles Milford Haven in having a fine natural harbour and in being a very long distance from any important hinterland. With the exception of coasting and fishing vessels it has little overseas trade. During the War it was converted into a first-class port by the Americans, who made their greatest base camp on the plateau behind the town, and so created an important local market, but the withdrawal of the American troops has led to its decline as an ocean port, as both Havre and Nantes are nearer the important regions of France. Its chief importance is as a naval fortress, its walls having been built by Richelieu and Vauban to protect the naval harbours against England (*cf.* Plymouth). It is the terminus of the Atlantic cable to Newfoundland.

Cherbourg (44,000 inhabitants) is nearer Paris, and is the naval fortress opposite Portsmouth. Its cattle and dairy market has already been noted, and it is also the passenger port for Atlantic liners, and has a considerable cross-Channel traffic with Southampton in dairy produce, fruit, and vegetables. It has 21,500,000 tons of shipping annually.

THE INTERIOR PLATEAU—ARGOAT

The plateaux of Cornouaille, Léon, etc., consist of unfertile granite soils partly covered with forests and moors. The streams fall in cascades to the coast or flow more gently into the basins of the interior. On the whole the centre of

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Brittany resembles the bog-lands of Connaught, with poor pastures supporting few cattle and a scanty population. The

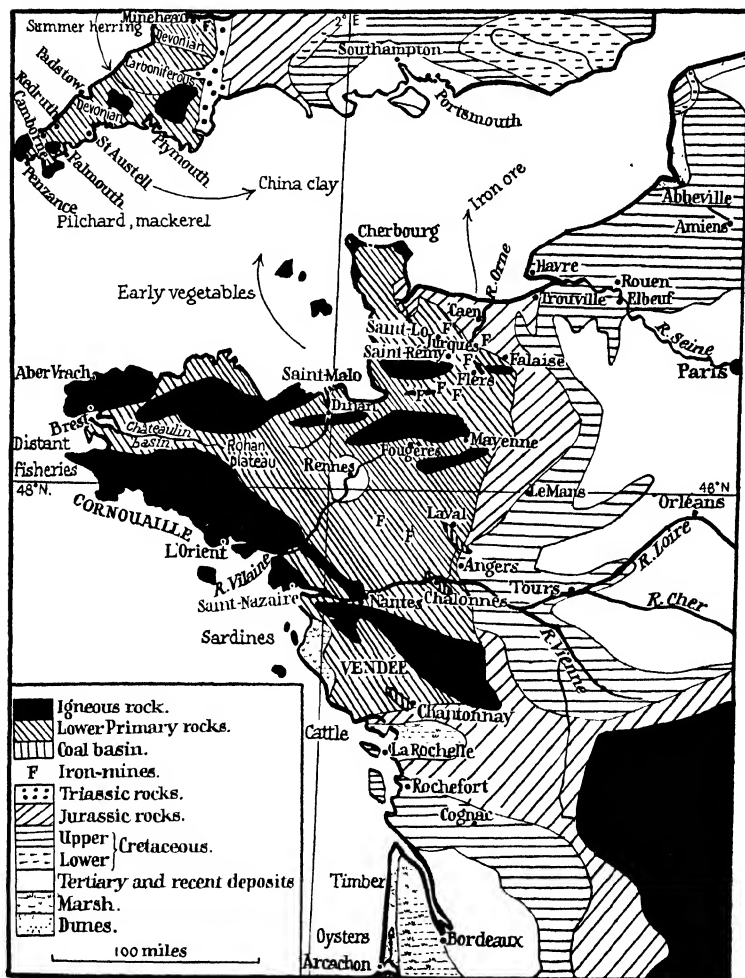


FIG. 20. MAP OF THE ARMORICAN PENINSULA

only industrial areas are in the iron-mining districts, though Fougères and Flers have small leather and cotton industries.

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In the better pastures of the basins cattle are now kept for dairying. Each of the basins supports a town. In the west Châteaulin has slate-quarries, and is connected by its river with the sea, and with Brest and Quimper by rail. It is a market for cattle and fish, but is completely overshadowed by Brest. In the east, in the basin of Rennes, occurs the only inlier of Tertiary rocks in the whole of Brittany. Rennes (83,000 inhabitants), on the upper Vilaine, is the market of the plateau region and forms the principal link between Brittany and the rest of France (*cf.* Exeter and Taunton). On the north of the cultivated area round the town lies the forest, which extends to Fougères, while to the south lies an area of unfertile grits covered with woods and moors. It is connected by canal with the Rance and the port of Saint-Malo. It was the capital of medieval Brittany, and, like the other cattle towns which commanded the line of the Vilaine and the Rance, possesses finely preserved examples of medieval architecture. The importance of these little towns was much greater in the Middle Ages than at the present time, and it is to their old-world appearance that these towns owe their summer tourist traffic.

CHAPTER VIII

FRANCE : THE CENTRAL PLATEAU

THE central plateau, like the Vosges and the Armorican peninsula, is composed of ancient and relatively unfertile rocks, but, unlike much of them, has been largely covered by the outpourings of recently extinct volcanoes, whose peaks rise in the Auvergne to 6000 feet above sea-level. There are numerous fractures and subsidences forming small rift valleys, such as are now occupied by the upper Loire and the Allier, or small depressions which contain the little coalfields which have been preserved round the edges. On the east the plateau falls steeply to the Rhône valley, and on the west it dips more gently into the plain of Aquitaine. Throughout the greater part of its perimeter the high land is fringed with Jurassic limestones through which the rivers which radiate from the peaks have cut deep trenches that seldom widen until they reach lower ground.

Like the Welsh uplands and the Ardennes, the central plateau is a region from which there is a constant stream of emigrants, who find work in the rich plains of the surrounding regions. The only means by which the highland regions can maintain a normal increase of population is by the development of industries, and the presence of coal- and water-power resources has led to the rise of manufactures in many of the valleys.

The climate is severe, with large daily extremes of temperature and heavy rainfall and snowfall. In spring the melted snows form torrents, which carry quantities of stones and silt into the upper parts of the basins of the Loire and Garonne and give to the Rhône mainstream a velocity which makes it very difficult for boats to ascend the river. Industries, in their demand for timber, have deforested the plateau. Many of the higher parts are moors and heaths, while the gentler slopes of the lower ground are under cultiva-

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tion. Erosion has stripped many parts of soil, and there is much waste land. In several districts, however, chestnuts and mulberries form the basis of the silk industry of the eastern valleys.

1. **The Centre.** There are three distinct volcanic districts—Auvergne, Velay, and Aubrac—where the necks of the volcanoes have resisted erosion and stand out as peaks of crystalline rock surrounded by plateaux of rich soil, which support large crops of rye. It is in the basins of Le Puy and Aurillac that the densest population is found, but in the older igneous districts of Forez, Margeride, and Millevaches there are poor pastures and woodlands, with a very scanty population engaged in the rearing of cattle, which are brought down to the valleys in winter and fattened on the rich volcanic soils of the Auvergne heights in summer. The farms generally consist of two holdings, one in the mountains and the second in the valleys, the cattle being marketed at the beginning of autumn at the great annual cattle fairs of the market towns, and especially at Clermont-Ferrand (112,000 inhabitants), the outlet of Auvergne. This town has developed fruit and confectionery industries and is the chief rubber-manufacturing centre of France. The other important manufactures are tanning and the making of cutlery in Cantal and at Thiers, which has considerable water-power. In the west of Auvergne, along the valley of the upper Dordogne, coal is found at Port-Dieu and Champagnac, while in the north, between the Sioule and Cher headstreams, there are coal-mines at Saint-Eloy and Commentry, where there is a thickness of between forty-five and sixty feet of workable coal. In the north-west a small field near Ahun (Aubusson) is connected by rail with Limoges. None of these coalfields is as fully developed as those of the east of the plateau, their total annual output being less than 1,000,000 tons.

2. The **causses** are limestone plateaux which fringe the volcanic regions on the south and south-west. The *causses* of Larzac and Sauveterre occupy the upper parts of the Hérault, Tarn, and Lot basins, and lie at a height of about 2500–3000 feet above sea-level. Their pasture is suitable for

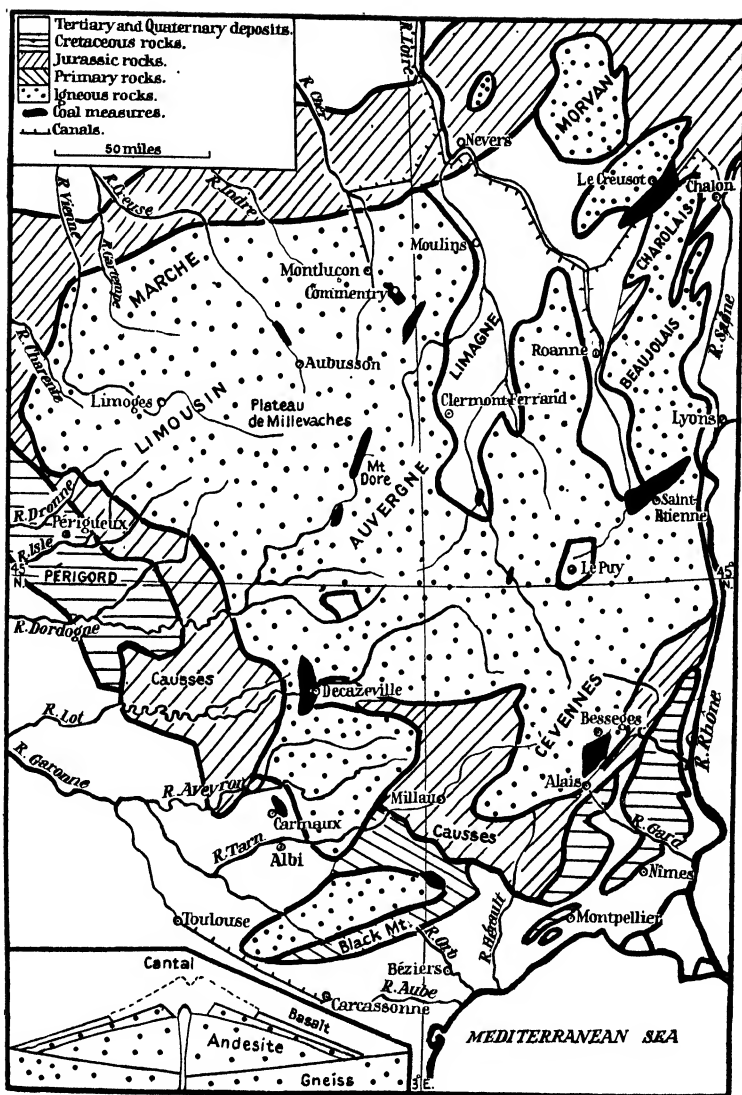


FIG. 21. THE CENTRAL PLATEAU

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sheep, while the valleys contain rich alluvial soils which provide pasture for dairy cattle (*cf.* Roquefort cheese). The little market towns of Millau, Mende, Florac, and Saint-Affrique are engaged in dairy and woollen industries. Toward the south-west the granitic Black Mountain is used as summer pasture for the sheep of Languedoc. Streams from the granite uplands provide water-power and soft water for the woollen manufactures of Lodève, Mazamet, Castres, and Saint-Pons. The sheep are sold in Languedoc at Béziers and Montpellier in the autumn. The *causses* of Périgord and Quercy form a transitional region leading to Aquitaine.

3. **Limousin and Marche** form the north-west of the plateau, an unfertile region of marshes and poor pastures. In their lower parts cereals and potatoes are grown, and the little towns of Guéret, Boussac, and Bourgneuf are sheep and cattle markets. Carpets are made at Aubusson, while the coalfield of Commentry and the iron ore of Berry have given rise to the metallurgical industries of Montluçon, the chief route centre. To the west of Limousin the valleys are more fertile, warmer, and damper than in the north. The chestnut-woods provide food for both the peasants and their cattle, and the rich meadows of the irrigated valleys are used as fattening grounds for the cattle raised in the uplands. There are a number of small market towns. To the south the soils are sufficiently fertile for the cultivation of wheat, peas, beans, and fruits. Limoges (98,000 inhabitants) is the great market for the horses, cattle, cereals, and fruit of the region, and manufactures leather, wool, glass, paper, and porcelain, the latter industry obtaining its kaolin from Saint-Yrieux.

4. The **eastern fringe and the Cévennes** have been fractured by the crustal forces which accompanied the Alpine folding. A series of faults which lie in a north-east-south-west direction has left a number of block mountains separated by depressions containing coalfields which support the industries of Le Creusot, Saint-Étienne, and Alais. Morvan is typical of the crystalline highlands, being covered with forests, marshes, and poor grasslands, with occasional fields of rye and buckwheat. The uplands of Charolais and Beau-

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jolais are similar, with the exception that the slopes overlooking the Rhône valley are covered with vineyards and the streams supply power for the domestic silk-, woollen-, and cotton-spinning industries of Tarare and Thizy. The cattle industry is dominant throughout, but in the extreme south the climate approximates to that of the Mediterranean, and mulberries can be grown. Silk is sent to Lyons and Saint-Étienne, but the amount produced is limited by foreign competition. In the Cévennes silk is more important than in Vivarais, while olives make their appearance on the interior highland and sheep take the place of cattle. The chief market is Vigan.

The lower country which borders the block mountains possesses more fertile soils, cattle being fattened on the Liassic clays and grains and vines grown on the limestones. The depressions are chiefly important because they have rich deposits of coal and provide routes leading from the Rhône valley to the Loire. The iron industry developed along lines similar to those common in Britain, the chief requirements being water-power, timber, and local iron ores. There were originally a very large number of small works, whose products were marketed locally. The poor condition of the roads and the existence of interior customs frontiers made it practically impossible for iron to be sold at any great distance from the ironworks. There was consequently a line of forges in the forests which formerly stretched from the Langres plateau to Languedoc. These had a purely temporary existence, and were closed down as soon as the local timber-supply was exhausted—*e.g.*, in the Black Mountain district near Carcassonne. Several districts possessed superior communications, and of these the Le Creusot depression had communications with the Rhône-Saône, the Loire, and the Paris basin.

In 1782 the royal ironworks were established at Le Creusot, and the ordnance factories flourished there until the end of the Napoleonic wars. At a later date the use of coke for smelting concentrated the iron industry on the coalfield. With the introduction of the Bessemer and open-hearth processes it became less profitable to make any except the finest

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qualities of steel on the coalfields of the central plateau. The canal of Charolais was the origin of the fortunes of Le Creusot, while the opening of the Berry Canal gave Montluçon its industrial importance. Saint-Étienne was linked to Andrezieux and afterward to Lyons. This was the earliest railway route in France, and a number of great metallurgical works grew up along it.

Very little iron ore is now obtained from the central plateau, and the output of pig-iron is less than half a million tons. Nevertheless, the advantages of an early start, of the accumulation of capital, and of the high technical efficiency of the metallurgical undertakings maintain important engineering industries in Saint-Étienne, Le Creusot, and Montluçon, the present tendency being toward the manufacture of industrial machinery, and especially of motor-cars, rubber being manufactured at Charmaux, Clermont-Ferrand, and Limoges. The Le Creusot region is one of the few in France where the workmen leave the works in summer in order to gather in the harvest. The chief coal-mining centre is Monceau-les-Mines. Le Creusot is the centre of a group of iron and steel industries with branches in many parts of France, and with interests in other countries—*e.g.*, the Belgian Campine and Czecho-Slovakia. The steel-works lie between Chalon-sur-Saône and Blanzay, but the manufacture of locomotives, Diesel engines, electrical and mining machinery, and alloys are found at the mouths of the Seine, Garonne, and Rhône, where raw materials are more easily obtained. The Saint-Étienne depression commands the principal route between Lyons and Clermont-Ferrand, Limoges, and Bordeaux, and the coalfield which it contains is one of the chief industrial districts in France. Saint-Étienne (193,000 inhabitants) is still an important metallurgical and coal centre, and manufactures small arms. It owes its present importance, however, to its nearness to Lyons, the chief industry being the manufacture of silk and cotton ribbons and velours (*cf.* Coventry). Its lead in the ribbon industry was due to the absence of labour restrictions and to its adoption of power machinery early in the nineteenth century, when it began to outstrip its rivals, Saint-Chamond, Saint-Didier,

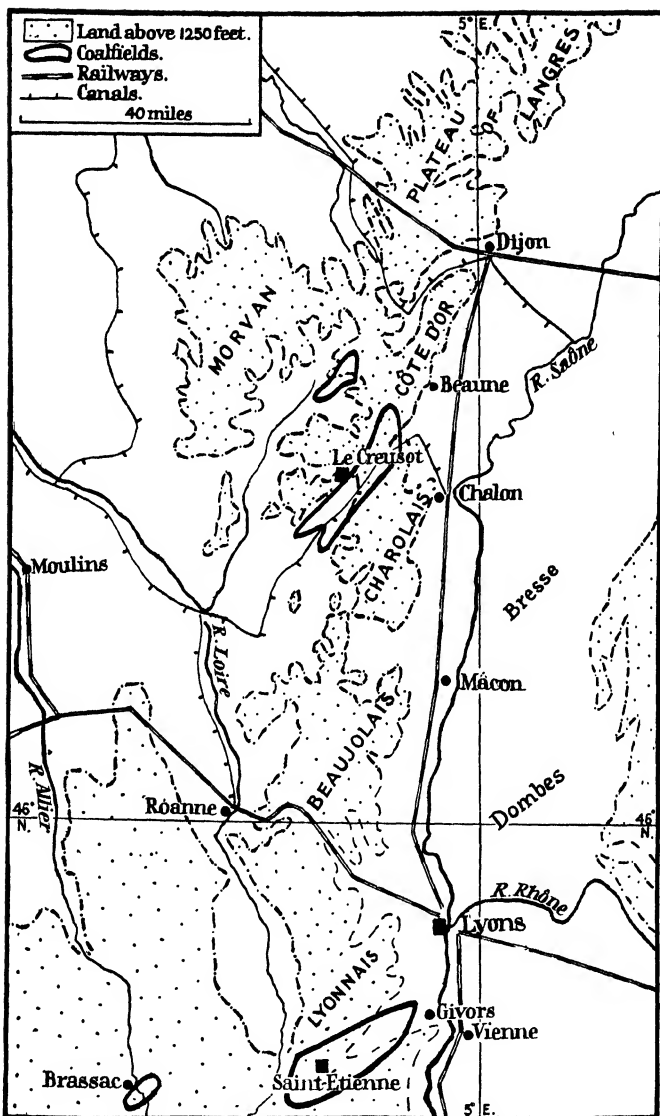


FIG. 22. SKETCH MAP OF THE LE CREUSOT AND SAINT-ÉTIENNE COALFIELDS

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and Rouen. Artificial silk tends to displace real silk, especially at Saint-Chamond, while wool and linen thread are also used. The coal is mined to a depth of only a few hundred feet, though there are good seams to a depth of 6000 feet. These lower seams are not mined because of the large number of faults, which render working expensive.

It has already been noted that raw silk is produced in the Cévennes round Vigan, Alais, Saint-Ambroix, and Andize. The Gard and Ardèche are the chief silk-spinning region of France, the climate being suitable for the cultivation of the mulberry, and the relatively dense population ensures a cheap labour-supply. Silk-spinning was originally a family industry, but large factories are now at work in Ardèche and at the mouth of the Rhône. The Gard still possesses a number of small factories.

The Alais basin possesses a small coalfield which supports metallurgical industries in the neighbourhood of Alais, La Grand' Combe, and Bessèges. It supplies power to the zinc-mines, cement-works, and textile centres, though there are still a large number of small mills where it has been possible to dam the torrents which have deep valleys in the south-eastern slopes of the Cévennes. In many cases the mill at the torrent has become the centre of a small village, though the total water-power available is much less than in the regions of impermeable rocks.

The Cévennes is a region of poor sheep pastures, with forests of chestnuts growing on the slopes between 1500 and 2500 feet above sea-level. The villages of the chestnut woodlands are small and almost inaccessible from the lower country. The life of the people is very hard, and there is now a constant stream of emigrants to the industrial districts. In former times the Cévennes were a refuge for the Protestant Camisards. Deforestation has expedited the movement of the population into the lower districts, but recently attempts to reafforest the edges of the plateau at L'Aigoual have proved successful, the object being to arrest the erosion of soil, which has in many parts led to the creation of what is practically desert country. Pine-trees are first grown to arrest erosion and to form a surface covering of soil, after

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which beeches are planted to hold the soil thus formed, the woods providing a new means of livelihood.

The upper parts of the plateau of the Cévennes and Black Mountain are covered with snow for several months, and the surface is much denuded by heavy storms, so that the general appearance is that of a steppe, with poor pasture to which the sheep of Low Languedoc are driven in the summer months. To the south the Cévennes are drained by the Hérault and the Black Mountain by the Orb, near the source of which, at Graissessac, is a small coalfield which supports the industries of Lodève, Saint-Pons, and Hérault and supplements the hydro-electric power of the upper Tarn, Thoré, and Hérault in the low-water season.

5. **The south-western coalfields** of the central plateau support local industries. In the Tarn basin, near Carmaux, there are several seams containing a total thickness of about seventy feet. In former times the peasants of the centre and south-west of the plateau left their homes in the autumn to act as hawkers and porters in Spain, which was formerly the richest country in the world because of its monopoly of the American goldfields. At the present time large numbers make their way to Paris for the winter, and work there as masons and carpenters. Many, however, have begun to take up work in the manufacturing towns of the coalfields, and the recent development of hydro-electric power on the Tarn and Aveyron, which is soon to be distributed by cable to the woollen centres, to Decazeville and to Toulouse, will have the effect of greatly increasing the manufacturing capacity of the south-west of the central plateau.

Already the textile industry of Mazamet and Castres and the glove manufacture of Millau are in a thriving condition, while Toulouse is developing the manufacture of fertilizers. Farther north Decazeville, which produces more than half a million tons of coal, as well as iron ore, has developed steel industries. The War stimulated the industries of the south-west, and Decazeville, which is surrounded by vineyards and fields of wheat, is rapidly becoming an important industrial centre.

CHAPTER IX

FRANCE: AQUITAINE

THE lowland area which lies between the central plateau, Armorica, and the Pyrenees resembles the Paris basin in being composed of a Tertiary region surrounded by Secondary rocks, chiefly Cretaceous and Jurassic limestones and marls, which weather into fertile soils. It is more isolated than the Paris basin, being entered by a very narrow gap, the Poitou gate, in the north and by a somewhat easier route, the Lauraguais or Carcassonne gate, in the south-east, leading to the plains of the Midi and the Mediterranean coast of Languedoc.

The Jurassic limestones form the surface of the Aunis, Angoumois, and Quercy plateaux, chalk forms the surface of the plains of Saintonge and Périgord, and Tertiary limestones surround the sands and clays of the Garonne basin, the river valleys containing alluvium. The climate differs from that of other parts of North-west Europe in being practically frost-free, and in having rather high summer temperatures, which allow maize to ripen. The rainfall is higher than in the other low-lying parts of France, and is very evenly distributed. The combination of fertile soil and genial climate makes Aquitaine important both for agricultural and for pastoral farming, while the abundance of limestone makes it the principal vine-growing region of France. Several distinct sub-regions may be distinguished, the dry limestones producing wool, wheat, and vines and the alluvial and clay soils being well-watered cattle pastures and maize-fields.

1. The **Charente basin** is a district of low limestone plateaux and valleys, the uplands being half-barren sheep pastures or poor grain country, the oak-woods supporting pigs and producing truffles while the valleys support a dense population engaged in fruit-growing and wheat-farming and

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in the cultivation of grapes for the champagne industry and for the distilleries of Cognac. Périgord lies between 200 and 600 feet above sea-level, and is similar to Charentais. The

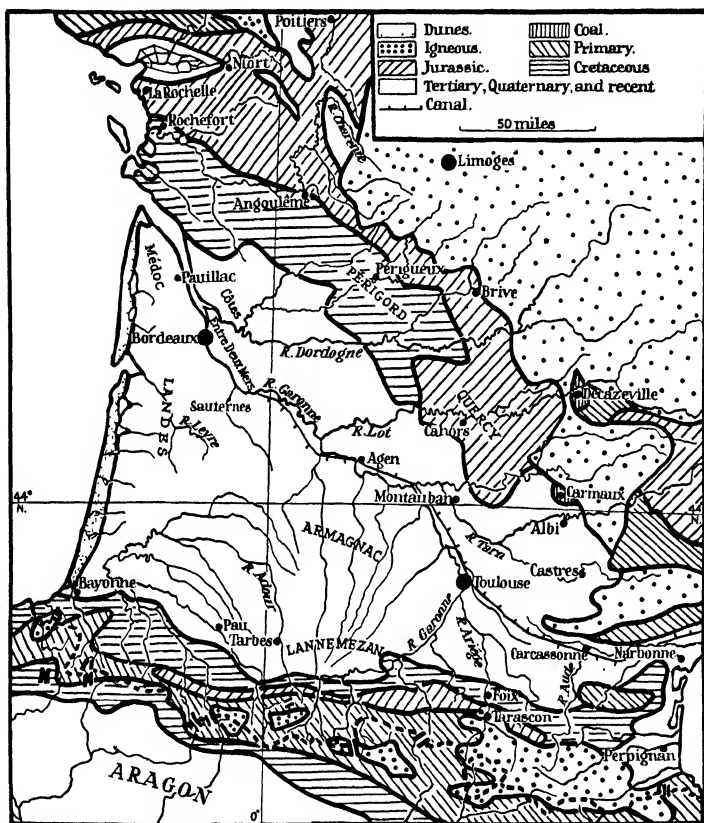


FIG. 23. AQUITAINE

lowlands of Double, where its streams reach impermeable soils, were formerly marshy, but have been drained to form fattening pastures for the cattle bred on the Limousin uplands of the central plateau. The Charente river is navigable as far as Angoulême, which manufactures paper, woollens,

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and pottery, the kaolin being imported from Cornwall. The lowest bridge-town, Rochefort (37,000 inhabitants), is a strongly fortified naval centre for submarines and destroyers (*cf.* Harwich), with an outpost at La Rochelle (36,000 inhabitants), an old Protestant refuge on a limestone headland, and at the present time the safest port in the Bay of Biscay, and one of the chief fishing-ports of France. These ports were important during the seventeenth and eighteenth centuries, but the decline of the Biscayan ports with the increased size of vessels during the nineteenth century has limited their naval importance, and their chief traffic is the import of coal, coke, fertilizers, wood-pulp, and china clay, and of wine carried in coasting vessels, which take as return cargoes fish, corn, potatoes, timber, wine, and cognac.

2. **Quercy** is a somewhat higher plateau, lying well above 1000 feet above sea-level. The dry uplands are suitable only for sheep, but the valley of the Lot is well wooded, its alluvial soils producing maize and fruits, while there are numerous vineyards on the valley slopes. The chief market is Cahors, whose bridge leads to the more fertile districts of the south. It is chiefly concerned with the production of foodstuffs, flour-milling, and the manufacture of leather.

3. **Albigeois and Lauraguais** consist of fertile Tertiary limestones which support vineyards in the valleys of the Aveyron, Agout, and Tarn. The valleys are used for the fattening of the mountain cattle and for the cultivation of peas, beans, and early vegetables. Carmaux manufactures hardware. Albi is the chief agricultural market of Albigeois. The walled city of Carcassonne, which commands the route from Gascony to Languedoc, was an important military fortress in the Middle Ages. It is now the chief centre of the trade in leather, cloth, and wool, and manufactures paper and flour.

4. **Lannemezan and the plateaux at the foot of the Pyrenees** lie at about 2000 feet above sea-level and consist of chalk and gravel covered by poor grassland suitable only for sheep pasture. Great developments have been made in hydro-electric power in the upper parts of the Garonne, and as there is no large market for power for lighting and traction a num-

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ber of electro-chemical industries, such as the manufacture of chlorates, aluminium, and calcium carbide, have come into existence. It is probable that the Garonne's wealth of water-power will revolutionize the conditions of life in the Pyreneean foothills, though a good deal of power will doubtless be transmitted to the older manufacturing centres of Bordeaux and Toulouse.

5. The **Pays de Gers**, or **Gascony**, forms a second step down from the Pyrenees to the plain of Aquitaine, and here the surface consists of hills of Tertiary limestone separated by clay valleys where maize, fruits, and vegetables are grown and cattle fattened during winter. The rivers are very irregular. Their floods endanger the fields and farmhouses of their lower courses, while in the dry seasons they have practically no water. Their deep trenches form an obstacle to communications, and there are only two routes between Bayonne and Toulouse. The chief railway follows the upper route from the head of the Garonne across the Lannemezan plateau to Tarbes and Lourdes, at the head of valleys in the Adour basin. This foothill region is famous for its mineral springs, and Lourdes is an important pilgrimage centre. The lower route crosses the Armagnac plateau to Auch, the chief market, and joins the Bordeaux-Bayonne route at Dax. The hydro-electric power of the Pyrenees is being used for the electrification of the railways.

The western part of Gascony (Chalosse) is wetter, and irrigation is easy, cattle-raising and the cultivation of maize and fruits being important in the neighbourhood of the chief towns, Dax and Saint-Sever.

6. The **Landes**, lying between Bayonne and Bordeaux, is a singularly inhospitable region of sand and marsh, where the shepherds still walk on stilts and live in poor thatched dwellings. Until the nineteenth century it was practically uninhabited, but the planting of pine-trees, originally intended for the building of ships of war, has proved so successful that large areas are now being reclaimed and brought under cultivation, cattle replacing sheep on the improved soils. Nevertheless, the Landes is still poor country, and apart from the timber trades has little importance. There

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are few villages, but Arcachon, the centre of the oyster trade, is remarkable for the success with which it has developed fish-farming. Bayonne (30,000 inhabitants), at the junction of the Nive and the Adour, is the medieval bridge-town commanding the route from France into Spain. Its chief importance is as a frontier fortress, but it also acts as the export port for the pit-props of the Landes and imports coal and iron ore for the forges of its outport, Boucau. There is also a coasting trade in flour and salt fish, but with the development of hydro-electric undertakings it is probable that the port will be improved.

7. The plains of the Garonne form the most important part of the basin of Aquitaine. In former times they formed a distinct political unit, Guienne. From Toulouse to the north-west stretches a series of well-peopled alluvial basins, whose only drawback is the liability to floods, particularly in spring and autumn. The risk of flooding prevents the development of towns on the actual banks of the river, except on the edges of the Tertiary plain in which the river has dug its bed. The Tertiary limestones produce large quantities of excellent hard wheat, while the alluvial plain of Toulousain is under maize where the drainage is good and meadow-land in the parts liable to flooding. Throughout the Garonne valley the vine occupies the river terraces and hill slopes, and the production of wine is the chief industry.

Toulouse (180,000 inhabitants), on the bend of the Garonne at the point where the Lauraguais gap (Col de Naurouze) opens to the lowlands of Aquitaine, is the principal town. Its local fertility and strong position above the average flood-level of the river made it the chief medieval fortress commanding the route from Aquitaine to the Mediterranean coast (*cf.* Carcassonne). It was the principal *entrepôt* for the trade between France and Spain, and being a royal fortress had a cannon foundry, the forerunner of its agricultural machinery industry. Its commercial importance and its remoteness from any other large town made it necessary that its industries should support a large area, and woollen, tobacco, and leather manufactures are still carried on. The War and the subsequent development of hydro-electric power

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on a large scale stimulated its industries, and it has now one of the largest fertilizer factories in France. To the south, in somewhat inaccessible districts in the Pyrenees, are valuable deposits of manganiferous iron ores suitable for the manufacture of steel of fine qualities. Toulouse is the obvious market for the cotton and woollen industries based on the water-power of the Tarn and upper Garonne, but its canal communications with the mouth of the Rhône and with the

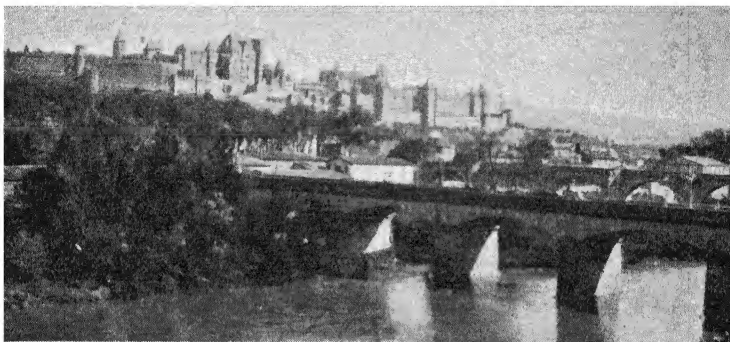


FIG. 24. CARCASSONNE FROM THE WEST

During the Middle Ages the gap between the Pyrenees and the Central Plateau of France was commanded by the strong fortress of Carcassonne.

By courtesy of the O.F.T.

lower navigable part of the Garonne are little used, the canal carrying less than half a million tons per year. With the electrification of the chief railways it is improbable that the seventeenth-century Midi Canal will ever become important, as the iron centres, Pamiers, Foix, and Tarascon, lie on the unnavigable Ariège, and are directly connected by rail with Toulouse.

The only town of any importance between Toulouse and Bordeaux is Agen, a railway junction connecting Périgueux with Toulouse. Beyond this point the belt of river alluvium narrows, and at Castets the lateral canal enters the Garonne. From Agen to Bordeaux the river is lined with orchards and vines, prunes being produced, as well as wine and brandy. Near Bordeaux are the vineyards which form the heart of

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the principal wine country in the world. Sauternes, Graves, and Médoc lie to the west of the river, and Entre-deux-Mers and Côtes on the east.

Bordeaux (256,000 inhabitants), the lowest bridge-town near the junction of the Dordogne and Garonne, is seventy miles from the open sea, and possesses safe anchorage for small sea-going ships, while large ocean-going vessels are able to discharge at Pauillac, the outport for the transatlantic trade. Throughout the Middle Ages it was an important port for the cross-Channel and coasting trade, but its rise from the position of a provincial capital was due to the opening up of trade with America during the seventeenth and eighteenth centuries. It declined somewhat after France lost her American colonies, and the world-*entrepôt* trade was attracted to London. Its recovery has been gradual. Its trade with the Argentine and Uruguay was helped by the emigration of Basque emigrants, wool, meat, and sometimes wheat being imported from South America. It controls a large share of the trade of the French West African colonies, from which it obtains groundnuts, cocoa, and palm oil for its soap, chocolate, and nut-oil industries. Normally it imports nearly 3,000,000 tons of coal, chemicals, and colonial produce as well as iron goods and foreign wines and spirits for its wine industry. Less than three-quarters of a million tons are exported, chiefly wine, timber from the Landes, dairy produce, and potatoes. Some bauxite, for the aluminium industry, and fruits, especially plums, are also sent overseas, but the greater part of its imports are manufactured locally for distribution to the French market. Pauillac possesses a metallurgical industry (*cf.* Saint-Nazaire). With the development of Morocco it is probable that Bordeaux will largely increase its African trade (*cf.* the rise of Marseilles with the development of Algeria). The trade with Britain consists of the exchange of timber for coal, coke, and copper sulphate (for the vineyards) with South Wales, and of the export of wines in exchange for manufactured goods with London.

8. **The Pyrenees.** The Pyrenees are a chain of folded mountains whose central ridges reach an average height of

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nearly 8000 feet, though several peaks rise more than 10,000 feet above sea-level, being covered with snow throughout the year. The French slopes are much more gradual than those of Spain, but throughout their length there are few passes between the two countries. The glaciers of the Ice Age have left numerous corries and gorges, and a number of small



FIG. 25. A CIRQUE LAKE IN THE PYRENEES

By courtesy of the O.F.T.

lakes act as reservoirs for the mountain streams, which are being rapidly harnessed for the development of water-power.

As their breadth varies between fifty and a hundred miles these mountains form a natural frontier, and the few routes which link France with Spain find their way round the extreme ends near the Bay of Biscay and the Mediterranean coasts, or through the Col de la Perche and Col de Perthuis in the east and the Pass of Roncesvalles (Roncevaux) in the west. The western ranges are wetter than those of the east, and the Spanish side is considerably drier than the French. Grain is cultivated to a height of more than 3000

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feet, and the forests of chestnuts in the west and of Mediterranean shrubs, oaks, and olives in the east merge into pine-woods which extend in places to nearly 10,000 feet above sea-level before they are replaced by Alpine pastures at the foot of the highest peaks. Transhumance is practised on both sides, though many of the Basques of the western mountains emigrate permanently to South America. Cattle, sheep, and mules are important in the west. The Central Pyrenees

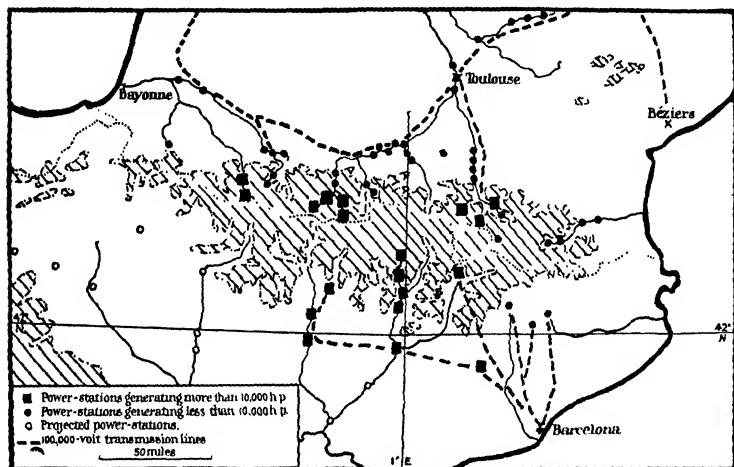


FIG. 26. SKETCH MAP OF THE HYDRO-ELECTRIC POWER
SYSTEM IN THE PYRENEES

have a core of barren crystalline rocks flanked by ridges of limestone, a region where there are few villages, the homes of shepherds and smugglers. The valleys of Andorra and the Ariège are warm and contain sufficient alluvium for the cultivation of maize, wheat, and fruit, while the iron ores have been used for centuries in the Catalan forges of the peasants of Tarascon and Andorra. The wool produced locally is manufactured into coarse cloth. Andorra in its isolation has retained its nominal independence since the eighth century. The development of hydro-electric power will probably break down the isolation of this little group of

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mountain people, especially as the Ariège, in France, and the Segre, in Spain, are now dotted with power-stations.

The Eastern Pyrenees consist of two ridges in the south and the Primary upland of Corbières in the north. It is in this region that deforestation has taken place on the largest scale, and communications between France and Catalonia are relatively easy. Between the Corbières plateau and the frontier range is the little plain of Roussillon, a former gulf now filled with alluvium and watered by several small rivers. Here vines, olives, early vegetables, and wheat are grown and marketed at Perpignan, the French border fortress. Port-Vendres is the centre of a wine trade, and is a packet station for Algeria.

CHAPTER X

FRANCE : THE RHÔNE BASIN

THE RHÔNE-SAÔNE BASIN

THE Saône valley is bounded on the west by the Jurassic escarpments of the Langres plateau, the Montagne and Côte d'Or or Dijon district, and by the steep granite slopes of Charolais and Beaujolais. On the east lies the Jura plateau, rising into the higher crests of the Jura Mountains. This Burgundian corridor, in spite of its general appearance, is not a rift valley, but a somewhat disturbed syncline, through which appears between the Saône and the Doubs a portion of the underlying Armorican ridge, Montagne de la Serre.

(a) The **Jura** is a chain of folded mountains rising in parallel ridges to more than 5000 feet above sea-level. Being composed of Jurassic rocks, they are much more fertile than the granite slopes of the central plateau, and are wooded almost to their summits. The people of the Jura are engaged in pastoral and forest industries, but the iron ores are not developed because of the poor railway communications. Except for relatively short tunnels under Mont Terrible in the north and near Pontarlier, there are no easy routes through the ranges from France to Switzerland. As in Switzerland, the French slopes are becoming increasingly important for dairy-farming, the cattle being brought down to the valleys in winter. In the south there are a number of vineyards, and in all districts small manufactures are carried on, especially in articles of metal, wood, and silk. The Jura plateau was the first centre for the making of artificial silk, and Besançon (58,000 inhabitants) has also become a centre for immigrant watchmakers from Switzerland and Germany. It is in the plateau and foothills that the milk is made into cheese and butter—*e.g.*, at Champignole and near Pontarlier.

(b) The **north-western scarplands** stretch from Langres to Chalonais. Here the soil is drier than the western slopes

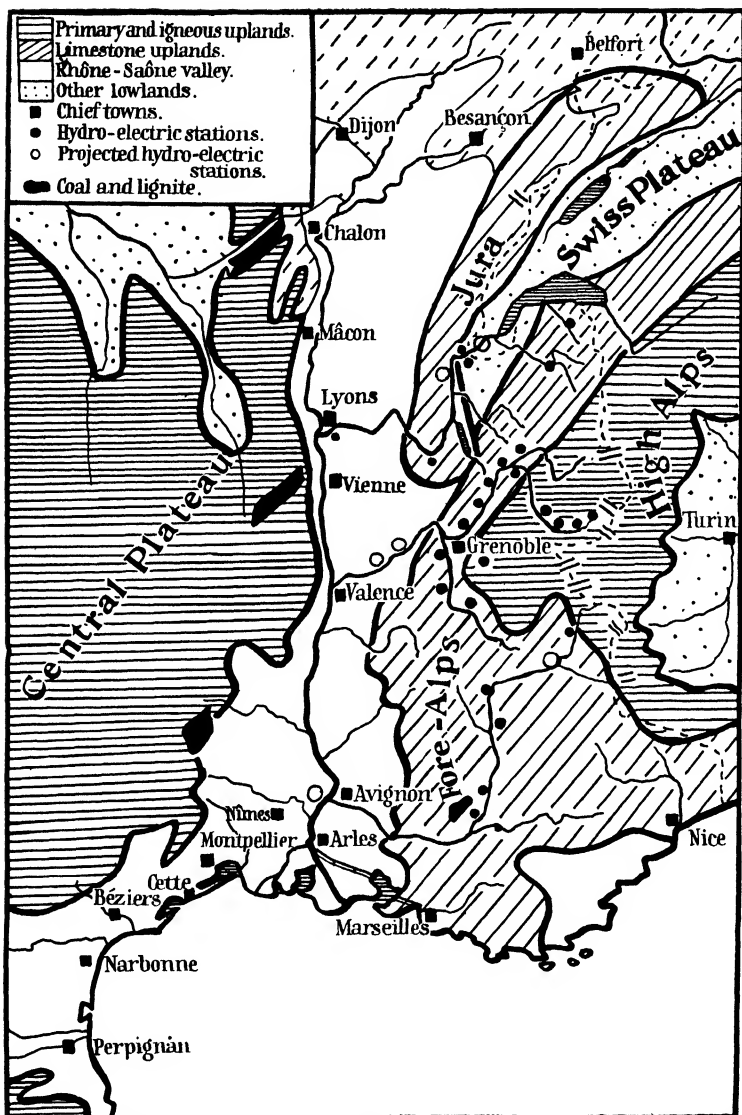


FIG. 27. SKETCH MAP OF THE RHÔNE VALLEY

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of the Vosges, and vineyards are more important (Burgundy wines). Dijon (84,000 inhabitants) is the chief town, and commands the Passage de Bourgogne, through which the railway and canal lead to the Paris basin. It is the market for the timber and cattle of Morvan, and is engaged in wine, beer, and food industries.

(c) The **plain of the Saône** is wide, but relatively unfertile and often flooded, so that though the Saône is navigable throughout its course there are few towns on its banks. The land near the river is chiefly under hay. Chalon, the chief market, shares in the steel industry of Le Creusot. Farther south the district on the north and east of Mâcon is covered with loess, on which wheat and maize are grown. This is the most famous area of Burgundy wines, while sugar-beet, vegetables, and poultry are important. The silted-up lake bed narrows to the south of Mâcon, and the eastern banks are covered with glacial *débris* as far as the confluence with the Rhône. This district of unhealthy marshes and barren moors is called the Dombes, and its scanty population is chiefly engaged in silk-weaving on hand-loom.

(d) The **Rhône** rises in the Swiss Alps, and its valley gives access to the heart of Switzerland, and through the Simplon route to Italy. In spite of the regularizing influence of its lakes it is liable to great fluctuations of volume, and upstream navigation is difficult, though 600-ton barges can reach Lyons and 300-ton barges the upper Saône. It is proposed to render the Rhône more easily navigable as far as the Swiss frontier by the construction of dams or weirs in connexion with sixteen hydro-electric power-stations, of which the chief are at Genissiat, Valence, Montélimar, Montdragon, Avignon, and Glau. It is proposed to use the water in the reservoirs for irrigation.

From Belfort to Lyons the climate resembles that of the Rhine area in that it has semi-continental extremes of temperature, with a maximum of rain in summer, but beyond Lyons there is a gradual transition to Mediterranean conditions, until at the mouth of the Rhône there is practically no frost in winter and no rainfall in summer. This change reveals itself in the sudden alteration in the kinds of vegeta-

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tion which clothe the valley slopes. The mulberry becomes important in Lyonnais, but it is not until Montélimar is reached that the olive marks the true beginning of Mediterranean conditions.

The junction of the Rhône and Saône is a point of great nodal importance. From Roman times Lyons (571,000 inhabitants) has been an important military centre at the junction of routes from France, Burgundy, Switzerland, and the Mediterranean. As its communications improved toward the end of the Middle Ages it developed into a first-class commercial centre. At first the district round Lyons was not important for the production of raw silk. The Arabs had introduced silk into Spain, Italy, and Greece, and silk cloths were carried over the Fréjus and Brenner Passes to the great fairs of Bavaria, the Rhine lands, and the Rhône valley. Early in the fifteenth century fairs were established at Lyons and Geneva, and as a result these towns became centres of immigration for Italian workmen from Milan and for Spanish immigrants from Burgos, Saragossa, Valencia, and Barcelona. Lyons accordingly became an *entrepôt* for the sale of silk goods and silk cloth, but attempts to establish a raw-silk industry were foiled by the opposition of the local merchants. Tours, which enjoyed royal patronage, became the chief centre of silk manufacture, though there were smaller industries at Marseilles, Toulouse, Montpellier, and Nîmes. Eventually, in the sixteenth century, Lyons was allowed to develop a silk industry, and rapidly rose to the position of chief silk-manufacturing centre of France. The reasons for its immediate success were (i) the already established market for silk goods provided an outlet for the cloth and yarn, (ii) the unrestricted conditions of labour made experiment and expansion possible, (iii) the climate was damp enough for spinning and for the growth of the young mulberry-leaves needed by the silkworm, (iv) water-power, and at a later period coal, and (v) easily navigable rivers offered facilities for the export of the finished cloth.

The existence of a dense population to ensure a cheap supply of labour is essential at the present time, and it is worth noting that three-quarters of France's output of raw silk is

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produced in regions of poor small farms where *métayage* still exists. Any great rise in the standard of wages has been accompanied by a decline in the output of raw silk, and it should be noted that the 1923 output of raw silk was less than half that of 1881. The centres of raw-silk production have already been noted, and also the tendency for the

establishment of large factories for spinning in Ardèche and Bouches-du-Rhône. The original spinning industry was carried out by families using direct water-power, and there are still many hand-loom used in weaving. Sixty-three per cent. of the yarn is obtained from the Gard and Ardèche, 30 per cent. from the Drôme, Bouches-du-Rhône, Hérault, and Vaucluse, and 7 per cent. from the Isère and Tarn and other outlying districts.

Lyons maintained its progress against Italian competition by being prepared for all the vagaries of fashion, because Paris was the centre of a brilliant Court which

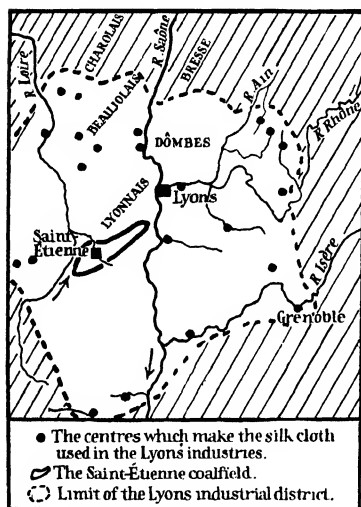


FIG. 28. THE INDUSTRIAL REGION OF LYONS

fostered the fine arts and attracted foreign purchasers. To a certain extent the existence of Paris hall-marked the produce of the looms of Lyons. The Revocation of the Edict of Nantes caused the industry to decline, and it was only by its export trade that Lyons was enabled to carry on during the French Revolution, when Church and Throne were no longer the chief purchasers. The restoration of the monarchy and the invention of the Jacquard loom, using steam-power, stimulated production during the nineteenth century, and workmen were found in the poor agricultural districts of Lyonnais, Beaujolais, and Fourvières. Lyons and Saint-Étienne have

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almost ceased to manufacture silk cloth, but remain the centres of designing and the markets for silk goods and ribbons. Of the 411 factories producing silk cloth in 1914 only fifty-eight were in Lyons, and these possessed less than 10 per cent. of the power-looms used in the industry. One-third of the factories are on the Isère, where water-power is abundant. Similarly in the ribbon industry, less than one-fifth of the works are actually in Saint-Étienne, most of the operatives using electrically driven looms in the hill districts. Throughout the exodus of workmen to the small valleys is marked, and the fall in the exchange value of the franc and the immigration of foreign workmen have done much to counteract the increase of wages due to France's loss of men during the War. The silk district escaped the worst effects of the War, and woollen and cotton industries were established in Lyons, which has also become the chief centre of artificial-silk manufacture in France. Below Lyons the river terraces are composed of alluvium brought down from the Alps. These terraces are wooded, while on the poor pastures there are sheep. In the tributary valleys, however, agriculture is carried on, giving rise to markets where the streams enter the Rhône, at Vienne, Valloire, and Valence. The climate in these districts is still extreme, but after passing through the gorge of Donzère the Rhône enters the Mediterranean region.

THE MEDITERRANEAN REGION OF FRANCE

To the south of Montélimar the climate of the Rhône valley forms a complete contrast to that of more northerly parts of France. Most of the rainfall occurs between October and March, leaving the ground moist during the sudden increase of temperature which occurs in early spring. As a result the character of the vegetation alters. Pasture is lacking, and the vegetation shows the characteristics of adaptation to drought. In spring there is a wonderful growth of bright flowers. The winters are marked by temperatures about 10° F. higher than those of the Paris basin, but the frequent occurrence of cold katabatic winds (the mistral) which flow down the valleys makes it impossible for oranges

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and other citrus fruits to be grown, except on sheltered parts of the coast to the east of the Rhône mouth. The olive and the evergreen oak are numerous, while the vine is found everywhere, and has displaced the formerly prevalent winter wheat.

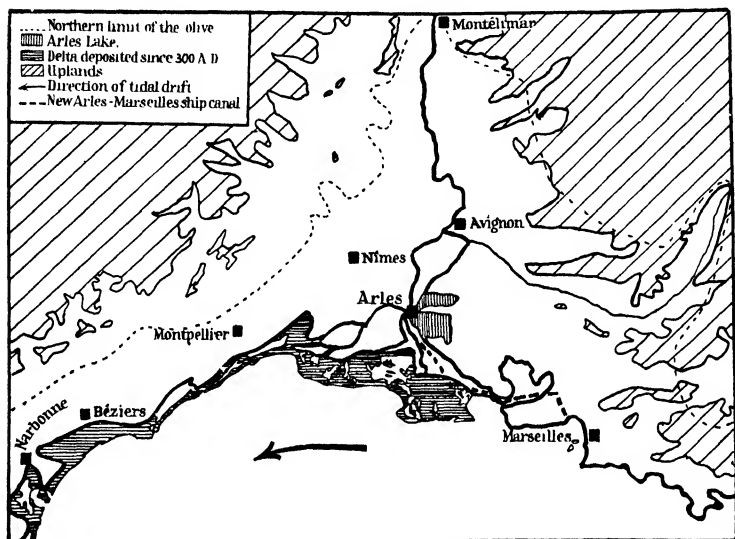


FIG. 29. THE RHÔNE DELTA IN ROMAN TIMES

West of the Rhône

The chalk plateaux of Gard and Ardèche produce wheat round Uzès and Alais, but farther south the soil becomes drier, and though the upper parts of the Hérault possess sheep pastures on the limestone garigues, where evergreen oaks lend variety to what would otherwise be dry and rocky pasture-land, the coastal plain of Languedoc would be almost semi-desert were it not for irrigation. Between 1863 and 1881 phylloxera devastated the older vineyards of France and made the cultivation of vines for wine profitable in new districts (*cf.* American cotton and the boll weevil). The prosperity of the wine industry of Languedoc was due to the

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introduction of American stocks between 1880 and 1890, and the cultivation of cereals was abandoned and olives were cut down to make room for vineyards during that period. The Midi now produces one-fifth of France's total output of wine. The cultivation of olives is gradually being given up in favour of the vine as other oils replace olive oil in commerce. The chief wine centres are Montpellier (83,000 inhabitants) and Nîmes (85,000 inhabitants), which owe their present prosperity to their railway connexions. Nîmes was one of the earliest Roman centres in France, and commanded the crossing of the Rhône at Beaucaire and Tarascon. Its nearness to the famous fair of Beaucaire made it one of the earliest silk-manufacturing centres of France. With Avignon it supplied the Papal Court, but it was overshadowed by Lyons early in the nineteenth century. It was therefore compelled to specialize in handwoven silks for export, and for a time successfully imitated Indian shawls. At the present time it makes tapestries, its silk-stocking industry having been concentrated in Vigan and Sumène. It is the market for the coal of Alais and the wine of Languedoc. Montpellier was a port throughout the Middle Ages, but was gradually silted up by the tidal drift from the east closing the lagoon entrances. It is now some distance inland (*cf.* Winchelsea), though the river Lez has been canalized to the seaside resort of Palavas.

The coast to the west of the Rhône mouth is a region of lagoons where salt is evaporated by workmen who come down from Lozère and the Cévennes in summer. Tunny fisheries are carried on by Corsican and Italian immigrants. Within the delta the Camargue supports herds of half-wild cattle. Cette, or Sete, at the outlet of the Toulouse and Beaucaire canals, is a small fortified fishing-port which imports Algerian and Spanish wine for mixing with French wine for the manufacture of brandies and liqueurs. Béziers (65,000 inhabitants) is the greatest wine centre, but is now far inland. Narbonne (29,000 inhabitants), like Béziers, is also of Roman origin, and is endeavouring to reopen its connexion with the Mediterranean by means of the out-port of La Nouvelle. Its chief importance is that it is the

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junction of railway routes from the Rhône valley, Aquitaine, and Spain. The plain of Roussillon forms the westward limit of the deltaic deposits of the Rhône and Cévennes rivers, and is watered by little streams which rise in the Eastern Pyrenees. In this isolated district a very intensive type of cultivation is carried on, the vineyards attracting large numbers of seasonal labourers from Spain and the uplands of South France during the harvest month, September. In winter cattle are brought down to the coastal marshes, while round the small towns—*e.g.*, Perpignan (39,000 inhabitants)—there are fields of wheat, early vegetables, beans, millet, potatoes, and hemp. The population is steadily increasing as irrigation is extended. The cultivation of the vine is continued on the south, up the slopes of the Pyrenees, in the frontier district of Albères, which also produces cork oaks.

East of the Rhône

The Western Alps consist of a series of folds which sweep in a great curve round the western end of the Po basin. Nevertheless, the folds are not always parallel, and there are numerous knots, especially where the older rocks are exposed in the Valais, Mont Blanc, Vanoise, Haute Dauphiné, and Mercantour groups. In the upper Durance there are still remains of the Tertiary covering which formerly extended over a great part of the Alpine region, but, as a rule, this has been removed by erosion, revealing a belt of Liassic deposits, which, being softer, form a series of depressions in which are the tributaries of the Durance and the main streams of the Isère. Surrounding the Liassic belt lie the lower chains of the Cretaceous folds through which the Isère breaks between Grenoble and Voreppe and the Durance at Sisteron, where it enters the plateau of Valensole. The alternation of strike and consequent streams is further complicated by the fact that the whole area was recently glaciated, giving a number of high passes, which are blocked with snow in winter. The formidable barrier which the Western Alps presents between France and Italy is crossed by a single railway tunnel between Modane, on the Arc, and Bardonnèche, at

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the head of the Dora Riparia. This is known as the Mont Cenis tunnel, but it actually passes under the Col de Fréjus. The roads of the Alpine passes have gradually been improved since the Napoleonic wars, and motor traffic crosses the principal passes, especially in summer.

There are several climatic subdivisions in the Western Alps. In the north Savoy has conditions similar to those of Central Europe, Haute Dauphiné, in the centre, is transitional between Central European and Mediterranean conditions, while the Little Alps of Provence have a Mediterranean climate. The High Alps of Savoy and Haute Dauphiné are barren regions of crystalline rocks covered with pasture and woodland. Seasonal migration of masons and the manufacture of wooden clocks and toys are characteristic, while there has been a constant stream of emigrants to America from the south of Dauphiné, conditions there being somewhat drier than in Savoy, where hydro-electric industries are tending to restrict emigration. Up to the present water-power has been used for machine shops and paper-mills, but with the installation of large electrical power-stations new industries, such as the manufacture of aluminium from the bauxite deposits of Var, have developed. It is estimated that more than one million horse-power will be obtained from the Isère and Durance alone, and already the electrical power is transmitted from Chambéry to Lyons for use in industry and for the electrification of the railway at Modane. It is proposed to electrify the Paris-Lyons-Marseilles Railway and to link the power of the Grenoble district, where it is used in the manufacture of steel, carbide, and aluminium, with Saint-Étienne. Genissiat is able to send power at economic rates a distance of nearly 270 miles to Paris. Nevertheless, the chief use for the power now developed in the French Alps will be in the wood-pulp, nitrate, silk, electro-metallurgical, and electro-chemical industries. The Drac and Isère flow along the Liassic depression and meet at Grenoble (86,000 inhabitants), where the dairy produce, timber, silk, gloves, jewellery, and paper produced in these valleys find an outlet. Farther south the climate becomes drier and sheep tend to replace cattle. There is no town

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comparable in importance with Grenoble on the Durance, though it will be possible to develop power at Sisteron for transmission to Marseilles.

The chalk zone consists of more permeable soils, which give forests and pastures in the region south of Geneva, which shares in the dairy industries of Switzerland. The chief town in the Fore-Alps of Savoy is Chambéry, which commands the gap between the Isère and Lake Bourget and the Rhône. In the south, in the chalk region of Dauphiné and Provence, the drier conditions give rise to the wine industry—*e.g.*, the manufacture of liqueurs at Chartreuse—though milk is still important.

Provence

South of Donzère the Rhône enters the most fertile part of its valley, where a number of streams provide sufficient water for most crops. This plain of Vaucluse is practically one large garden, with meadows, market-gardens, and orchards protected from the mistral by sheltering fences of reeds and hedges of cypress. The greatest development of the district of Orange and Avignon has been since the railways have given access to the Riviera and to Paris. Moreover, water-power is abundant, and is responsible for the development of the saw-milling, silk, and paper industries. The towns are situated on river terraces because of the danger of flooding. Avignon (52,000 inhabitants), where an island facilitated bridging, was for a long period the centre of the Papal Court, and during the fourteenth century had a population of nearly 100,000. The chalk plateau through which the Durance makes its way into the main valley is chiefly sheep pasture, except where irrigation has given rise to the cultivation of olives, which are marketed in Marseilles and Salon. Beyond the Durance the chalk reappears in the Alpilles ridge, where the ancient village of Baux, which was occupied from prehistoric times till the nineteenth century, has been abandoned for a more suitable site in the irrigable land in the valley below. On both the north and the south of the Alpilles the Durance is connected with the Rhône by canals to Tarascon and Arles. The southern Canal de Cra-

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ponne follows a gap through Lamanon, and is used for the irrigation of the stony semi-desert of the Crau. With the extension of irrigation the Crau has gradually come under cultivation, and wheat, vines, and olives are grown, while the marshes have been partially drained to form cattle pastures. The population of La Crau was doubled during the nine-

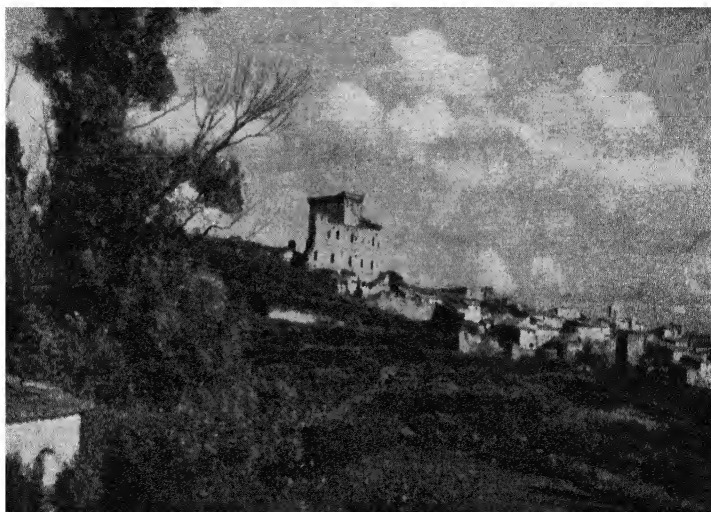


FIG. 30. CHÂTEAUNEUF-DU-PAPE, NEAR AVIGNON

For centuries the residence of the Popes has been the centre of numerous vineyards, and the old vinestocks are carefully tended and the wine made according to traditional methods. As this district lies in Mediterranean France the roofs are almost flat, and should be contrasted with those of Northern and Central Europe, where heavy snowfalls are experienced. The hillside sites of the villages of Mediterranean France were chosen for defence against Saracen invaders.

By special permission of G. Arland, Lyons

teenth century, though there is still a considerable area which remains as semi-desert.

Lying between the marshes and the river, Arles (35,000 inhabitants in 1911 and 31,000 in 1921) owed its origin to its being the lowest bridge-town of the Rhône. It was the capital of the Gauls of Provence, and became an important fortress and port under the Romans, being connected with the Mediterranean by a small canal. During the Middle Ages

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it was overshadowed by Avignon, and its present development is due to the irrigation of the semi-desert country which lies to the east. It is the outlet of the Canal de Craponne, the other branch of which ends at Salon (13,000 inhabitants), the principal oil and soap centre in Provence. Arles retains its cattle, wool, and salt trade and manufactures silk thread, soap, and glass bottles, but it has also become a tourist centre during the present century, because of its numerous Roman remains. The Rhône mouth is no longer deep enough to admit seagoing ships, and Arles to-day possesses no overseas trade. The Camargue is the low marshland of the Rhône delta formed to the west of the Rhône mainstream by the drift of the tides from the east. Within the dunes there are numerous salt marshes, some of which have been drained, the north of the delta being cultivated and the south left as pasture for cattle, horses, and sheep. The crops grown in the north are cereals, fodder crops, vegetables, fruits, and vines. Salt is still obtained by evaporation, and the workmen in the salt-pans and the fishermen still occupy rude cabins of reeds built in circular plan in order to resist the violent mistral of the winter months.

The south-east of Provence is mountainous, and is drained by rapidly flowing streams, of which the Arc, Huveaune, Argens, and Var are the most important. Irrigation has given rise to cultivation in the valleys and market towns, and ports exist at the points where the valleys open out on the plains, as at Aix, or on the coast, as at Marseilles, Saint-Raphael, and Nice. In the High Alps and Maritime Alps the climate is very dry, and the valleys are too narrow for cultivation, except in the interior basins, where cereals and olives are grown. Elsewhere the mountain-sides are used as sheep pastures. The limestone plateaux which lie to the south-west of the mountains are also chiefly used for sheep-rearing, but the granite uplands of Estérel and Maures have impermeable soils covered with maquis. Many parts of the granite plateaux are almost semi-desert, though where there are soils flowers are cultivated for the perfume industry—*e.g.*, at Grasse and Nice.

The coast produces Mediterranean crops, the chief industries being the manufacture of oil and perfumes. The coast

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of the Maritime Alps is rocky, and shelters a number of winter resorts, of which Nice is the chief. In the tiny independent state of Monaco is the pleasure resort of Monte Carlo. The coasts of Estérel and Maures possess a few resorts. The only important harbour is the naval port of Toulon (115,000 inhabitants).

The beauty of the Riviera, as well as its magnificent climate, which is hardly affected by the mistral, has made the south-eastern coast of France the greatest winter resort in the world, and the whole of the town life of the Côte d'Azur has been remodelled to fit in with the requirements of the thousands of visitors who spend part of the winter in the pleasant sunshine of the coast between Genoa and Cannes. In summer it is almost deserted by visitors, but in winter its population is trebled.

The minerals of the south-eastern extremity of France include coal, which is mined on a small scale at Manosque, in the Durance valley, lignite, which lies near the surface between layers of schists and bituminous soils, to the north of Marseilles, and bauxite, which was originally mined in the region of Baux, near Arles. The lignite-mines of the Fuveau district produce nearly a million tons per annum, the chief mines being at Gardanne and Valdonne, which supply the industries of Marseilles. France produces about 60 per cent. of the world's output of bauxite, but less than 20 per cent. is now mined near Arles, the bulk of the European supply coming from the department of Var, north of Nice. Normally the world's output is about half a million tons, of which France produces 300,000 tons, and the world's production of aluminium is controlled by the United States, France, Germany, and Britain, more than half the French output of the ore being exported to the United States, Germany, Scotland, and North Wales. The ore retained by France is converted into aluminium at the hydro-electric stations at Calypso, on the Valloirette, Saint-Jean-de-Maurienne, on the Arc, and on the lower Isère.

To the east of the Rhône delta, at the mouth of the irrigated valley of the Huveaune, is Marseilles (652,000 inhabitants), the chief centre of the overseas trade of France and

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the fifth of the great European ports (24,000,000 tons per annum). The town originated as a small Greek trading station commanding the route up the Rhône valley. As the delta was not easy to navigate, the Arles Canal was constructed in 1802 to drain the marshes of the left bank and to avoid the ever-changing mouth of the Rhône. During the Middle Ages Marseilles was only important as a link between Genoa and France, and during the period between the discovery of the Cape route to the East and the construction of the Suez Canal Marseilles was not much more important than Bordeaux. It controlled a large share of the trade of the Black Sea and North Africa, however, and with the opening of the Suez Canal its commerce rapidly increased, especially when railways were opened and Algeria colonized. Its overseas connexions were extended to the Far East, Africa, and America, and it retained its importance as the chief *entrepôt* of the Mediterranean and Black Seas. Regular sailings were instituted to French Indo-China and the Far East, to India, the Black Sea, and the Levant, to the West African colonies, the Americas, and to North-west Europe, and it became the chief market for the import of coal, wool, petroleum, rubber, jute, wheat, rice, sugar, and, above all, of the raw materials of the vegetable-oil manufactures—cotton-seed, palm oil, olives, and nuts. Water used both for power and for drinking purposes had been brought to the town from the Durance early in the nineteenth century, and, with the local and imported coal-supplies, Marseilles has become one of the greatest industrial centres in France, its population having been trebled since 1850. Space for these and other manufactures has recently been found not in Marseilles itself, but around the Étang de Berre, to the north-west, which is joined by canal both to the Rhône and to the port of Marseilles. The latter connexion (Rove) involves a tunnel under a span of the Maritime Alps. The manufactures of Marseilles include not only soap, margarine, vegetable oils, scent, and wine, but also various metallurgical industries. The chief items of its import trade are coal (2,000,000 tons from South Wales), grain (1,000,000 tons from North Africa, and oil-seeds (600,000 tons), and it ex-

THE RHÔNE BASIN

ports cotton, silk, and woollen goods produced in France and re-exports coal, petroleum, coffee, and wines. Sixty per cent. of its trade is with North Africa, Spain, Portugal, and Northern Europe, 12 per cent. with Italy and the Adriatic, 8 per cent. with the Levant, 8 per cent. with the Far East, 4 per cent. with West Africa, and a little more than 2 per cent. with North America. Besides its heavy goods traffic it possesses an important overland trade in mails and passengers. The ship canal to the mainstream of the Rhône should materially increase the down-stream traffic in potash, iron, and coal and the import of North African phosphates, wheat, oil, lime, and cement.

Corsica is a fragment of the ancient continent of which the Estérel and Maures uplands formed a part. The west and central parts are mountainous, and are composed of granite. The east consists of calcareous rocks, which have weathered into a marshy plain along the east coast. The plain resembles that of Languedoc, with groves of palms and plantations of oranges. In the mountains vines and olives are grown, with a little wheat. A great deal of the mountains, however, is covered with maquis, though there are woods of cork oak and considerable areas of sheep pasture. The chestnut is an important source of food, which, with olive oil, wine, mutton, and goat's milk, provides practically all the food needed by the islanders. Corsica's mountaineers have always been independent in spite of the fact that its coasts have been successively in the hands of the Greeks, Tuscans, Romans, Saracens, Spaniards, Genoese, and, finally, of the French. It is a question whether the Corsicans, with their indomitable pride and individuality, would have submitted so completely to the French had it not been for the marvellous rise of their fellow-countryman, Napoleon Bonaparte. Nevertheless, the island is more Italian than French, and an Italian dialect is the language of the countryside. A kind of transhumance is practised, the cultivators of the lowlands going to the forests of chestnuts during the summer, while the shepherds and mule-breeders ascend to the highest pastures, returning to the chestnut zone in autumn, and the other peasants descend to gather the olive

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harvest during the winter months. With the development of roads and railways the lawlessness of the island is beginning to disappear, but its mineral wealth is largely untouched, though there are several mines of antimony and asbestos. The tourist industry is increasing. Ajaccio (25,000 inhabitants) is the capital and chief port.

CHAPTER XI

FRANCE : COMMUNICATIONS AND TRADE

WITH the Roman conquest France obtained an excellent system of well-made roads, of which the following were the chief: (i) The coast road from Italy along the Rhône valley through Arles and Avignon to Lyons, Langres, Metz, Trèves, and Cologne, with branches to Strasbourg, Basel, and Lake Geneva on the east, and with western routes to Narbonne, Toulouse, and Bordeaux, to Limoges, Tours, Brest, and Cherbourg; (ii) the western route from Roncevaux through Bordeaux, Tours, and the Seine valley to Paris, Rouen, and Harfleur; (iii) the north-west system of roads radiating from Reims to Troyes, Trèves, and Liège. In the Roman road system there was no great centralization of routes, except at Lyons, Langres, Trèves, and, above all, at Reims. Paris was relatively unimportant.

With the coming of the Franks the system of Roman roads began to fall into decay, and the commerce of the country was carried on increasingly by means of the rivers. Troyes became the chief trade centre. Other fairs came into existence near Paris and in other parts of Champagne, and associations arose, such as the Hanse of Rouen, the Parisian Corporation of Traffickers by Water, the merchants of the Loire and of Bordeaux. These associations also organized overseas trade to Flanders, Italy, and Spain. Unfortunately for France the misgovernment during the great monarchies was so bad that trade fell into decay and the numerous interior customs frontiers hindered both agricultural and industrial expansion, so that even after the French Revolution each town became the centre of a small self-supporting district, and the movement of goods over a large area was restricted.

The development of French colonies and the military ambitions of the kings of the seventeenth and eighteenth

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centuries led to some improvement in the road system, which was then made to centre in Paris. The ports of the Channel and the Bay of Biscay were engaged in the North Atlantic trade, but outside the fortresses and American and West Indian trading-ports trade was of a purely local character, and heavy taxation prevented any great improvement in agricultural production. The one great market in France

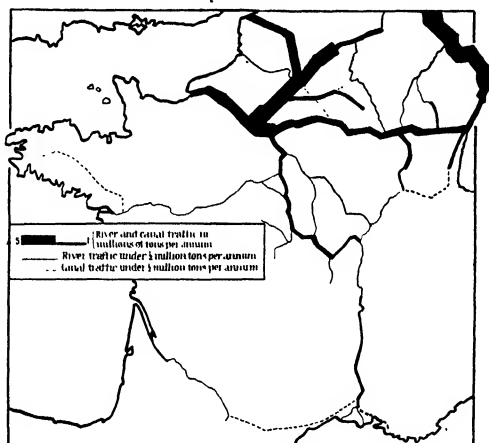


FIG. 31. INLAND WATERWAYS OF FRANCE

was Paris, which continued to grow while the smaller towns developed more gradually.

The canals of France were built during the seventeenth and eighteenth centuries in order to link up the navigable stretches of the rivers, and further canals have been constructed during the nineteenth and present centuries. The effect of this piecemeal method of construction is seriously to limit their usefulness. The canals differ in depth and width, so that it is impossible to use the larger barges on the smaller canals. This prevents the through carriage of goods without break of bulk. Moreover, the competition of the railways, which date from 1840-70, has left many parts of France without commercial waterways. The construction

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of lateral canals along the valleys of the Loire and Rhône has not been carried out, and the Canal d'Alsace has not as yet been completed. The greatest canal traffic is in the north, where the northern tributaries of the Seine are linked with the Sambre, Meuse, Escaut, and Lys and with Calais and Dunkirk. In 1913 the inland waterways of France carried little more than one-fifth of the traffic carried by the railways, and even after the War, when the coal shortage increased the cost of railway transport, the amount of water-borne traffic was less than one-quarter of that carried by rail.

TONNAGE OF THE PRINCIPAL INLAND WATERWAYS

	Million tons
The Seine between Paris and the Oise	8.7
The Seine between the Oise and Rouen	4.1
The Oise	5.5
The Saint-Quentin Canal	7.9
The Sensée Canal	5.1
The Rhine-Marne Canal	4.5
The Loire Canal	1.8
The Loing Canal	1.6
The Canal du Centre	1.5
The Canal de l'Est	1.5
The Saône	1.1
The Oise-Aisne Canal	2.2
The Marne-Saône Canal	1.0

None of the other canals carries a million tons per annum, though it is interesting to note that there is about three-quarters of a million tons of water-borne traffic between Lyons and Arles, on the Rhône. The chief inland ports are Paris (20,000,000 tons), Rouen (3,500,000 tons), and Strasbourg (2,500,000 tons). The famous Languedoc, or Midi, Canal, between Narbonne and the Garonne, carries about 400,000 tons of timber, grain, and wine.

Railways came late in France¹ and were naturally centred on Paris. During recent years there has been a tendency to

¹ When the first great trunk-line from Paris to Orléans was made it was necessary to introduce English 'navvies' for the work. These men were a source of astonishment to the French bystanders, who used to exclaim: "Mon Dieu! Les Anglais, comme ils travaillent!" Even railway construction in the early days needed skilled labour.

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electrify the trunk-lines, and a number of sections are driven by hydro-electric power, while in the north Paris has a local system of electrified railways, and there is an abundant supply of cheap electricity for the electrification of the railways of the North French coalfield. A number of transit routes through Laon or Dijon avoid Paris for through traffic between the Channel ports and Switzerland and the Rhône valley, and there is a very important transit trade in mails and passengers from Britain through France to the East. While the principal material carried by the inland waterways is coal, there is only one important ship canal, between Arles and Marseilles. The Étang de Berre is being converted into a port and new industrial region. The projected Rhône Canal has a threefold object: (i) to obtain about 1,000,000 horsepower for industry, (ii) to irrigate part of Provence, and (iii) to render the Rhône navigable to the Swiss frontier. The Grand Canal d'Alsace is planned to connect Basel and Strasbourg on the west bank of the Rhine, and the Rhine Commission has approved the Swiss scheme for improving navigation between these ports and the French scheme of obtaining hydro-electric power. The barrage at Kembs is already in operation, and the port of Huningue (Hünigen) at Basel is being rapidly improved to accommodate large Rhine barges.

THE EXTERNAL TRADE OF FRANCE

Of France's external trade 70 per cent. of imports consist of raw materials, 20 per cent. of foodstuffs, and only 10 per cent. of manufactured goods, whereas exports consist mainly of manufactured goods (72 per cent.), while raw materials normally form only 20 per cent. and foodstuffs only 8 per cent. of the total. The chief items of the import trade are cotton, coal, wool, cereals, silk, petroleum, oil-seeds, coffee, machinery, sugar, and wines from the French colonial possessions in North Africa, while the exports are chiefly textiles (linen, silk, cotton, and woollen goods), pearls, wines, motor-cars and machinery, chemicals, fruits and vegetables. A certain amount of pig-iron and iron ore is exported, together

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with small quantities of sugar, raw wool, skins, and furs. A very small quantity of meat is imported, and the timber of the Landes is sent to South Wales as a return cargo in the ships which bring coal to the Biscayan ports.

The present total external trade of France is considerably greater than in 1913, though the increase is less than would be suggested by the values expressed in francs because of the fluctuations in the rate of exchange. The most remarkable increases are in the amounts of raw material imported, which have increased about 30 per cent. since 1913, and in the export of manufactured goods, which have increased 80 per cent. above pre-War levels. The exports of French manufactures go principally to Britain (21 per cent. of total exports), Belgium (19 per cent.), and the French colonies (13 per cent.), the goods exported being textile fabrics and clothing, motor-cars, vegetables, fruits, and wines to Britain, woollens and iron and steel to Belgium, and cotton goods to the French colonies. In only one case does France export chiefly raw materials, silk and iron and steel being sent through the country to the industrial towns of Switzerland.

The imports are obtained from almost every country in the world, but chiefly from Britain (15 per cent. of total imports), which supplies coal, raw wool, and machinery, the United States (15 per cent.), from which raw cotton, petroleum, copper, and grain are obtained, Germany (13 per cent.), which sends coal, machinery, and iron- and steel-manufactured goods to France, and the French colonies (9 per cent.), the chief items being Algerian wine and grain. With other countries the imports are chiefly raw materials and food-stuffs and the exports silk, cotton, woollen, and linen fabrics, motor-cars, wines, and iron and steel goods. Raw silk is chiefly obtained from Italy, China, and Japan, wool and grain from Australia and the Argentine, and cotton from India and Egypt. Coffee is obtained principally from Brazil, Havre being one of the principal coffee markets of Europe. Trade with Russia has languished since 1913, but under normal pre-War conditions Russia supplied France with flax, timber, grain, and petroleum, and with small quantities of gold and platinum, receiving iron and steel and textile goods

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and wine in exchange. A large amount of French capital was invested in Russian concerns, and it is largely Russia's refusal to acknowledge its liability for its pre-War debts to France and Britain which accounts for the hostility investors display toward the present Government of Russia.

THE PRESENT ECONOMIC POSITION OF FRANCE

Wherever a successful revolution of landless peasants has been followed by the subdivision of the land into small farms owned by the peasantry there has generally followed a period when the capital needed for the large-scale organization of agricultural production for export has been absent. Crops have been grown chiefly for local use, the surplus being taken into the small industrial towns which grew with the railway systems during the nineteenth century. In the case of France, not only agriculture, but also industry was organized on a domestic basis before the World War.

The wheat harvest is still the principal feature of the agriculture of France, the crop in 1925 being about 9,000,000 tons (6 per cent. of the world's total output for that year). The only countries which produce more wheat—the United States, Russia, and Canada—have much larger areas of land suited to the cultivation of wheat. Even after the World War France continued to produce wheat from all kinds of soil, and the average yield, except in the fertile Beauce and similar districts, was low and the grain was harvested chiefly for local food. The most important agricultural export is wine, and the output is worth more than half the total value of the French wheat crop. Each river valley produces a characteristic variety of wine: Bordeaux in the Garonne basin, Champagne in the Falaise, Burgundy in the Saône valley, and Rhine wines in Alsace.

Unlike wheat, vine cultivation is an intensive industry, which requires much labour in summer, and especially during the vintage. Imported labour from Spain and Italy was much used during the Great War, and is still in demand in some parts—*e.g.*, the Midi—during the vintage. Wines are sold by the districts which produce them. Few crops are so

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affected by the soil, temperature, and rainfall, so that special varieties are often limited to quite small areas. As much labour, expensive apparatus, and highly specialized methods are needed to produce wines of the correct flavour, the industry shows no tendency to migrate to other districts, especially as a long time is needed to establish a reputation. There is,

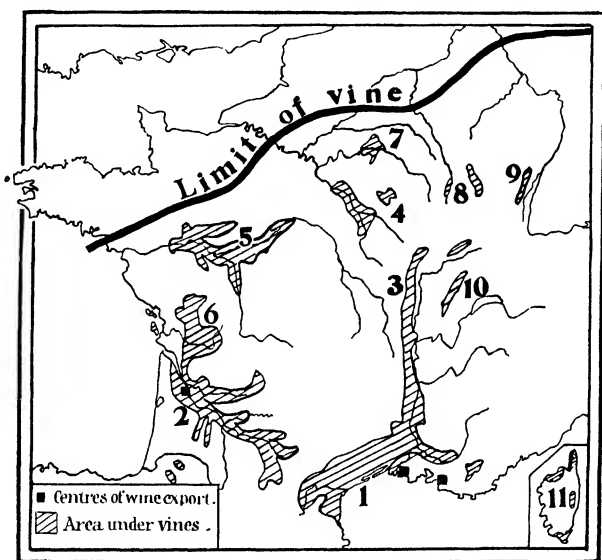


FIG. 32. WINE DISTRICTS OF FRANCE

1, Midi (15-20 per cent. of area); 2, Bordeaux (15-20 per cent.); 3, Cote d'Or and Beaujolais (10-15 per cent.); 4, Burgundy (3-10 per cent.); 5, Loire (3-10 per cent.); 6, Charente (3-10 per cent.); 7, Champagne (less than 3 per cent.); 8, Lorraine (less than 3 per cent.); 9, Alsace (less than 3 per cent.); 10, Jura (3-5 per cent.); 11, Corsica (less than 3 per cent.).

however, a geographical cause which partly accounts for the superior quality of French wines—*i.e.*, that grapes reach their highest quality near the northern limit of vine cultivation. This limit is marked by the area where rain falls in late summer and early autumn, and where the clouds cut off the sun's rays during the ripening season. The vine-bearing region, therefore, lies to the south-east of a line joining Nantes to Paris and Cologne. To the north-west of this

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line the summers are too damp and grapes are grown on a commercial scale only under glass—*e.g.*, at Bailleul. The total area under vines in France is about 3,500,000 acres, little more than one-quarter of the area under wheat.

About 42 per cent. of the present area of France is under cultivation. Wheat is grown on 23 per cent., oats on 15 per cent., vines on 7 per cent., and potatoes on 6 per cent. of the arable area. The greatest output of cereals is obtained from the Paris basin, oats and potatoes being most important in the west of Picardy, Artois, and Flanders, wheat being more important in the east of these districts and to the immediate east and south of Paris, in Brie and Beauce. Potatoes are grown in the poorer districts of Brittany, Lorraine, and the central plateau, while sugar-beet is chiefly cultivated in the north of the Paris basin and in the North French coalfield, where there is a very dense population. The other sugar-beet districts are the Limagne, near the Loire coalfield, and in the Gard river valley, round the Alais coalfield. Normally France produces about three-quarters of a million tons of sugar, and because of the four years' occupation of the Franco-Belgian coalfield the area cultivated was almost halved, and as many of the refineries were destroyed the actual sugar obtained was less than half the pre-War average. Gradually, however, the output of industrial crops has increased since 1918, and many varieties of fruit are grown—*e.g.*, apples and pears near the Channel coasts and in Limagne, plums in Agénois, and peaches, cherries, and olives in the south. Chestnuts and other nuts are gathered in the central plateau, while in the Paris basin market-gardening is carried on. In each of these cases there is a surplus above local requirements, and such industries as the manufacture of cider, the export of market-garden produce, and the fattening of stock for sale at some distance from the chestnut-woods of the central plateau are used to dispose of the crops which cannot be entirely consumed in the producing districts. The area under flax, which has been cultivated for many centuries in the Lys and neighbouring valleys of the north, was within the German lines during the World War, and cultivation was then begun in the Landes

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and Basses-Pyrénées. The result was that in 1920 there was a temporary increase of the area under cultivation, to 91,000 acres (*cf.* 54,000 acres in 1910). As Russia has not yet reached her pre-War export of flax, the area under the crop in France has not yet declined to pre-War levels. In the case of hemp, however, which is grown round Laval, Le Mans, and Angers, the area under cultivation is gradually shrinking, as is the case with tobacco grown in the Garonne and in the north of the Paris basin. There are still 75,000 producers of raw silk in France, and though the War, by increasing wages, had the effect of reducing the output of cocoons to about 1000 tons, the depreciation of the exchange value of the franc enabled the lower Rhône districts to produce raw silk at competitive prices, production at the present time being practically at pre-War level (2000 tons). Nevertheless, sericulture is unimportant, no less than 96 per cent. of the silk used in French industry being imported either from the Far East or from Italy.

Of the 58 per cent. of France which is not under crops 19 per cent. is either meadow or permanent pasture, 19 per cent. is forest, and nearly 20 per cent. is moorland, mountain, and marsh. We have already noted several areas, especially in the centre and south of France, where land is not under cultivation. In many districts before the War careless and inefficient methods of cultivation were common. The pastures are now used, it is true, for the rearing of cattle, in the west of the Paris basin and in the mountains (dairy cattle being especially important along the Channel coasts), but, except in the north, the cattle industries can nowhere compare in intensity with the dairy industries of the Dutch, Belgians, and Danes, who have an average of more than 150 cattle per square mile (*cf.* France 70, and the United Kingdom 97, per square mile). There has been a continuous decrease in the number of sheep stocked in France, and at the present time they are kept only in the poorer regions, which are unfit for cultivation. Here, as elsewhere in Continental Europe, the number of sheep is an index to the amount of waste land, the number now stocked being less than one-third of the number stocked in 1840. France is

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thus becoming increasingly dependent on imported supplies of wool and frozen mutton. Pigs used to be kept only in the oak-forests, but there is a tendency to develop pork and bacon industries in the dairy and grain districts of the north and west.

The War shook France to her foundations, and the immense losses in man-power—for, even with the addition of 1,700,000 people in Alsace-Lorraine, the population in 1921 was nearly half a million less than in 1911—affected agricultural rather than industrial production. To a certain extent this decrease in the population has been remedied by immigration from Italy, Spain, Belgium, Czecho-Slovakia, and Poland. Probably nearly two million foreigners have made their homes in France since the War. Many of these have become French citizens.

The more general use of machinery and the striking progress in factory organization and division of labour caused by the necessity for large-scale output during the War, and the subsequent shortage of workmen, has enabled France to make good to a great extent the losses due to the War. In fact, large advances have been made in the great staples of production—wheat, sugar-beet, vegetables, and fruits. The livestock shortage, even when accentuated by the increased consumption of meat after the War, has been made good. The railway systems have been overhauled, and several electric railways have been developed. The installation of electricity for power and light in rural districts has made great progress, and has done much to remedy the shortage of labour.

Water-power development is receiving State support, and the power developed increased from 850,000 horse-power in 1913 to 2,700,000 horse-power in 1925 under the stimulus of War conditions and of the high price of imported coal. The hydro-electric industry is of very recent development, and two-thirds of the power used at the present time has been developed during the past fifteen years. For water-power a natural waterfall is not essential, but if pipes leading water to an artificial fall are used the initial outlay is greater than where a torrent is harnessed. The essential need is a con-

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stant supply of water throughout the year, since otherwise either the works will have to close down during the low-water season or enormous expenditure will have to be incurred in the construction of huge dams to pond up the flood water for use during the dry period.

We have already seen that the rivers of France are of two kinds—those which flow in the north and west through a region of abundant rainfall at all seasons and those which flow into the Mediterranean, receiving large volumes of snow and ice-water from the Alps and Pyrenees during the early spring, and forming floods in autumn and winter from the winter rains. The chief hydro-electric stations are therefore situated in the Alps and Pyrenees, and the smaller ones in the valleys which radiate from the central plateau. The greatest power developments have taken place in the high transverse valleys leading from the north-western parts of the Alps into the Rhône basin, where a steady flow is maintained even in the summer months because of the melting of the snow and ice. The power developed in the Isère and its tributaries, the Doron, Arc, and Romanche, is about 410,000 horse-power, and is used in electro-chemical manufacture in the Doron valley and in the aluminium and other metallurgical industries in the Arc and Romanche districts, the surplus power being transmitted to Lyons. In the upper Arve and Bonnant about 240,000 horse-power could be developed, and explosives are made at Chedé, the surplus being sent to Ugines, a metallurgical centre in the Isère basin. Up to the present the lower valleys leading into the Rhône have not been fully exploited, only 150,000 horse-power being developed, chiefly in the Fier valley, below Lake Annecy, and at Saint-Beron, on the Guier. The total power developed in the Rhône and the Isère is about 800,000 horse-power. The Southern Alps are less important because they are less high and have a smaller precipitation. The chief stations are at Argentière, which manufactures aluminium, and at several stations on the middle Durance, which develops about 150,000 horse-power for the industries and lighting of Provence, and especially of Marseilles. The whole of the Southern Alpine district produces about 250,000

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horse-power. The main valley of the Rhône has only three stations at present, but it is proposed eventually to develop 387,000 horse-power. The Jura possess between 200,000 and 300,000 available horse-power, but only 80,000 horse-power are used at present, principally in small local works.

The Pyrenees possess less available water-power than the French Alps, but probably 1,000,000 horse-power will be obtained as soon as there is sufficient demand for the power. The Western Pyrenees are not as high as the central and eastern parts of the chain, and the only important works are in the valleys of the upper Neste, the Ossau, the Pau (south of Lourdes), the Ariège, and the Aude. The total power developed in the French Pyrenees is about 350,000 horse-power, but this is not used continuously during the low-water season because of the absence of large glacier lakes, which might be utilized as reservoirs. The upper streams of the Garonne and Tarn produce nearly three-quarters of the power at present developed for the manufacture of such chemicals as chlorate and carbide, and for the production of aluminium in the Ariège. The eastern districts possess considerably less power, which is used in the small industries of the Orb and Hérault—*e.g.*, woollens. The Central Massif has developed less than 300,000 horse-power in connexion with the steel-works of Saint-Chamond and Le Creusot, the metallurgical works of Albi, the leather-, glass-, and rubber-works of Limoges and Charmaux and the textile manufactures of Saint-Étienne, Roanne, Mazamet, and Aubusson. The surplus power is sent south to Bordeaux.

The total hydro-electric power estimated to be available in France is about 10,000,000 horse-power, but it is probable that not more than 7,000,000 horse-power can be developed economically. Of this 50 per cent. is in the Alpine districts of the south-east, 20 per cent. in the Pyrenees, 14 per cent. in the central plateau, 10 per cent. in the Vosges and Rhine, 9 per cent. in the Jura, and 4 per cent. in the rest of France. Forty per cent. of the power is used in electro-chemical and electro-metallurgical industries, because the chief hydro-electric centres lie at a considerable distance from the older industrial districts. As a matter of fact, the power obtained

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from coal is even now more important than that obtained from water, and several of the hydro-electric power-stations projected, such as the Canal d'Alsace and the tidal power works at Abervrach, have not been completed for lack of funds.

The chief point to be remembered, however, is that the water-power now developed is equivalent to that derived from about 27,000,000 tons of coal, and as the coal output of France has increased by 25,000,000 tons it is clear that France's manufacturing capacity has more than doubled since 1913. Moreover, the factories damaged or destroyed during the War have been rebuilt or re-equipped on a modern scale, and the iron and steel manufacturing industries have benefited by the addition of the new German works at Rombas, Knutange, and Hagondage, in Lorraine. Large new engineering works have been built at Paris, Lyons, Saint-Étienne, Bordeaux, and Montluçon. Even in the devastated departments, containing between 60 and 90 per cent. of the spindles and looms used in cotton, woollen, and linen manufactures, the greater portion of the losses has been replaced by the most up-to-date types of factory machinery.

During the War industrial undertakings were transferred from the war areas to Paris, Lyons, Saint-Étienne, Rouen, Caen, Bordeaux, Marseilles, Nantes, Le Creusot, Saint-Nazaire, Limoges, and Grenoble. Old woollen centres such as Elbeuf, Vienne, Castres, and Lavelanet increased their capacity, and places like Lyons, Toulouse, Bordeaux, and the Pyrenees became important for cottons and woollens. The natural silk industry became stronger with the decline of Barmen and Krefeld, and new artificial-silk works were erected at Calais, Rouen, Lyons, and Troyes. The lace industry of Calais and Caudry is greater now than in 1914. The recovery of Alsace has doubled the cotton-printing capacity of France, and has added 25 per cent. to the number of cotton spindles of the country. New chemical industries have developed and new processes have been developed—*e.g.*, the making of synthetic ammonia at Toulouse.

New raw materials, such as petroleum, potash, coal, and iron ore, have been brought within the borders by the inclu-

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sion of Alsace-Lorraine, while the Saar coal output is taken by France until 1935. The iron ore producing capacity of the country has been doubled, and in 1926 the French output of iron was about 39,500,000 tons, and is now increasing in consequence of a pooling arrangement with Belgium, Luxemburg, and Germany. The coal output of Lorraine is about 6,000,000 tons, and that of the Saar about 12,000,000 tons. The potash of Lorraine has relieved France of the need for importing an essential raw material for agriculture, the output of 1,250,000 tons being sufficient for France's needs, and providing a considerable surplus for export.

The historic weakness of France in this industrial age has been the relatively small coal output when compared with that of Germany, Britain, and even Belgium. The production of coal is now considerably more than in 1913, and the war-damaged mines of Courrières, Ostricourt, Lens, Anzin, Liévin, and Béthune are now completely restored, and their re-equipment has been carried out on modern lines. In many cases patent coke-ovens, with by-product recovery plants, have been built, so that North France is now an important centre for the manufacture of benzol, ammonium sulphate, and pitch, and for the generation of electrical power from the residual gases. It is possible that when the new coke-ovens in Pas-de-Calais are completed considerably less coke will be required from Durham, Yorkshire, and South Wales.

THE EFFECT OF THE DAWES PLAN

The first method of paying reparations to France led to the exclusion of British coal from the markets of France and Italy, our principal customers for export coal. In the latter case the exports dropped from 10,000,000 tons to 7,000,000 tons in 1921, while in France German coal was sold in the Channel ports at prices which kept out that of South Wales. In 1922 the French industrialists, finding themselves in possession of the magnificently equipped blast-furnaces and steel-works of German Lorraine, embarked on a career of iron and steel production for export. The occupation of the Rhenish-Westphalian industrial region failed to increase the

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supply of coke or of coking coal for the French furnaces because of the stubborn resistance of the German nation, and the French ironworks were compelled to purchase coke in Durham and Yorkshire at inflated prices.

France has continued her policy of industrializing her iron and steel industry, and, with the adoption of the Dawes Plan, Germany has again supplied France with cheap fuel and the import from Britain has declined, except in anthracite, which can be obtained in quantity only from the west of the South Wales coalfield or from Pennsylvania. The competition from France has caused a marked retrogression of the British iron, steel, and coal industries, while the production of pig-iron and steel in France has been so great that Britain has been displaced from the position of the third greatest of the world's iron-manufacturing countries. France now commands a volume of trade in the export of iron and steel goods six times as great as that which she had in 1913.

There is one other feature in which the industry of France is very different from what it was before the War. Millions of foreigners belonging to the armies revisited France after 1918, and the war area still attracts large numbers of pilgrims and more casual visitors from overseas. To accommodate the largely increased number of visitors the French have organized a great tourist industry, and France has become the principal tourist country in Europe.

CHAPTER XII

THE LOW COUNTRIES: PHYSICAL CONDITIONS AND ECONOMIC SUB-REGIONS OF BELGIUM

BELGIUM occupies an area about twice the size of Yorkshire. It possesses few natural frontiers, except along the Meuse, and even there the narrow strip of Dutch Limburg cannot be

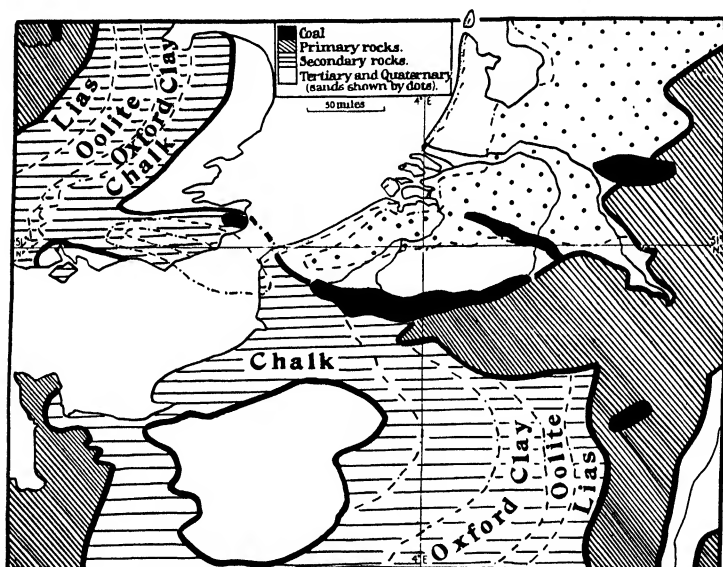


FIG. 33. LONDON, PARIS, AND FLANDERS BASINS

said to separate Belgium and Germany to any considerable extent. The south-western frontier is parallel to the 'collines' of Artois, and it is because of her desire for forward posts in the Flanders plain, lying parallel to the ridge of chalk downs, that a small area of Flanders is retained by France. For defensive purposes France has always tried to maintain a foothold in the Flemish plain. Belgium is there-

BELGIUM: PHYSICAL CONDITIONS

fore a buffer state between France and Germany, and commands the main routes between the North European plain, the Channel coast of France, and the Paris basin.

As communications in all directions are relatively easy, Belgium is peculiarly a country where races, cultures, and religions have mingled. The dominant races of Belgium are the French-speaking Walloons and the Flemish, who speak a Low German dialect similar to Dutch. In fact, the principal distinction between the Flemish and the Dutch lies in their religious beliefs, the Dutch being Protestants and the Flemish Roman Catholics. The Walloons are chiefly found in the industrial districts and the Flemish in the purely farming regions of the west and north, which were formerly separated from the south and east by woodland. Nevertheless, the two races are now found in every part of the country, and as there is no very marked difference in cultural level there is no racial problem comparable to those which exist in Eastern Europe.¹

THE ECONOMIC IMPORTANCE OF BELGIUM

Besides possessing a fertile soil Belgium enters into intimate contact with its four great neighbours—agricultural and artistic France, industrial and scientific Germany, manufacturing and commercial Britain, and the colony-owning maritime Netherlands. It is to its close relationship with its neighbours that Belgium's rapid economic development is due, and it is noteworthy that within four hundred miles of Brussels lies the greater part of industrial Europe, including Hamburg, Leipzig, Zürich, Saint-Étienne, Nantes, and Manchester. The ease with which transport can be effected within this area, and especially within Belgium itself, has caused that country to become the commercial heart as well as the battleground of Europe.

¹ It should be noted, however, that there is a Flemish independence movement, having as its expressed object the secession of the Flemish districts of France, Belgium, and Holland to form a new state, Flanders. Riots occurred during the 1930 centenary celebrations of Belgian independence, and the Belgian Army is being separated into a Flemish corps and a Walloon corps, each under its own officers.

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THE PHYSICAL REGIONS OF BELGIUM

1. **The Coastal Plain.** As in French Flanders, the coastal districts form two well-marked regions, the dunes and the polders.

(a) The Dune Coast resembles that of the French coast north of Calais, and forms a region of small fishing-ports and seaside watering-places.

(b) The Polders are marshy, and often lie below the level of high tide. They have been almost entirely drained by pumping, and are chiefly used to provide pasture for cattle. Dairy-farming is becoming increasingly important (*cf.* Furnes and Alkmaar).

2. The **central plain**, which lies above sea-level, may also be subdivided into regions of sand and sandy loam.

(a) The low sandy plains ('Flandre sablonneuse') stretch from the east of Flanders to the Campine, through Dixmude, Bruges, Termonde, Louvain, Hasselt, and Maastricht into the Kempenland and Geest of Holland and Germany. These regions originally consisted entirely of flat, wet, barren heaths, pine-forests, and high fens, but in several districts the surface soils have been improved sufficiently for the production of commercial crops.

(b) The upper plains of sandy loam ('limoneuse') stretch from Ypres to Liège, north of the Sambre and Meuse, continuing through Dutch Limburg into what was formerly the Duchy of Julich. The soil changes from clay in the Ypres district to sand in the north-east. This forms the chief arable farming area in Belgium, though the economic development of the corresponding parts of Dutch Limburg and Cleves has been hindered by the poorer communications of those districts. Here and there, as at Mont de l'Enclus and Mont Kemmel, are several low hills which have not been washed away by denudation. These form strategic centres in time of war.

3. The **Belgian Uplands** consist of three distinct areas, the Condroz, the Ardennes, and the district of Arlon.

(a) The Condroz limestone district is an area of Carboniferous and other limestones, which form parallel ridges

BELGIUM: PHYSICAL CONDITIONS

separated by clay depressions. The clay areas form good agricultural and forest lands, while the limestones are devoted to stock-raising.

(b) The Ardennes consist of ancient crystalline and slaty rocks deeply etched by rivers whose ravines are well wooded. The level plateau districts are badly drained sheep and cattle pastures.

(c) Arlon is a small district where the Jurassic belt of Lorraine crosses the frontiers of Belgium and Luxemburg. In its commercial relations it belongs to France rather than to Belgium, and though its soils are not rich they make fairly good farm-land. The Montmédy district shares in the iron industry of Lorraine and Luxemburg.

CLIMATE

Flanders possesses an equable climate, though its temperature conditions are somewhat more extreme than those of London or Paris. Nowhere is there more than fifty days of frost in the year, and the mean annual range of temperature is everywhere less than 30° F. The rainfall ranges from less than twenty inches on the coast to forty inches in the district between Ghent and Alost, conditions suitable for both grain and root crops. The Campine lies in the north-east of Belgium, where the climate becomes more extreme, with ninety days when frost occurs and an annual temperature range of more than 35° F. The rainfall is fairly heavy, and averages more than thirty inches per annum. The 'limoneuse' district of the south has a smaller temperature range, 30° F., and about fifty-two days of frost. The rainfall, however, is somewhat heavier, between thirty-two and thirty-five inches. The Condroz has a still heavier rainfall, while the range of temperature is about 34° F., frost occurring on more than a hundred days. The Ardennes has a severe climate, resembling that of Central Europe. The rainfall is heavy (from forty to sixty inches), while there are more than 140 days of frost during the year. Even in the summer the climate is colder than in the other parts of Belgium, and there are many parts where wheat cannot ripen.

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DRAINAGE

Throughout Belgium and Holland the inland waterways are important for both transport and irrigation. The Dutch rivers also form the most important feature in the lines of defence against Continental attack. None of the Belgian rivers rise in high mountains, and, as a rule, they flow gently in meandering but navigable channels. Thus the Meuse enters Belgium at a height of about 330 feet, the Escaut at forty-six feet, and the Yser at seventeen feet above sea-level. The Escaut, or Scheldt, enters Belgium near Cambrai, and its channel is navigable from there to the sea. As it meanders a great deal, it has been canalized from its junction with the Lys to the French border. It forms an important line of communication for heavy traffic from the industrial district of Valenciennes, from Hainaut, the 'limoneuse' and Pays de Waes agricultural districts, to one of the greatest ports in Europe, Antwerp. In 1903 the upper Escaut carried 640,000 tons to Ghent, the Canal de Bruges 299,000 tons, the lower Escaut 884,000 tons, and the Lys 120,000 tons.

By means of the Lys valley the Escaut is connected with Armentières on the west of the North French coalfield, by the Deûle Canal with Lille, by the Haine with Mons, the Borinage, and the Sambre-Meuse industrial region, by the Dendre with Alost, and by the Senne with Brussels. To the south-east of Antwerp the Dyle, Démer, and Nèthe drain the Campine. The lower Escaut is tidal as far as Termonde, at the junction of the Senne, while there are two mouths to its estuary, the West Scheldt, to the south of Flushing, and the East Scheldt, which has been allowed to become partially sited at the point where the railway between Flushing and Roosendaal crosses.

The Lys rises in France, and its course is not particularly well suited to inland navigation. It has therefore been canalized from Aire, on the North French coalfield, to Armentières, where it crosses the frontier. At Warneton it is joined by the Deule, which is canalized as far as Lille and Roubaix. The principal town on the Lys navigation is Courtrai, while on its tributary, the Mandel, is the town of

BELGIUM: PHYSICAL CONDITIONS

Roulers. Where the Lys joins the Escaut is the important industrial and commercial centre of Ghent, which is connected with Terneuzen, in Holland, by the Terneuzen Canal. The Rupel basin consists of the Nèthe and Dyle rivers, which drain the Campine plateau, and the Senne, which determines the main line of communications between Antwerp and Brussels. A canal is projected which will connect the Nèthe with Gheel and the Campine coalfield. The Dyle is navigable from Louvain, while its northern tributary, the Démer, drains the south of the Campine coalfield. The collieries are at Genck and Winterslag, the dormitory and market town being Hasselt.

THE MEUSE BASIN

1. The Upper Meuse from the Langres Plateau to the Franco-Belgian Frontier

The Meuse rises about 1300 feet above sea-level in the Langres plateau, and near Bazoilles disappears underground for a distance of about four miles before it emerges at Neufchâteau. From Verdun the river is navigable, but a lateral canal has been constructed from Saint-Mihiel, where a branch connects it with Toul and the Rhine-Marne Canal. Throughout the greater part of its upper course the Meuse flows through the clay valley of the Woivre, and at Donchère, near Sedan, it is joined by the Canal des Ardennes, which links it with the Aisne, and thus with the Paris basin. As the Meuse-Rhine-Marne route is only available for barges of small dimensions, and as the meanderings of the river through the gorges of the Ardennes cause the journey to take four times as long as the deep-water route through the Scheldt and the Rhine, there is very little through traffic between Antwerp and Alsace-Lorraine by the Meuse valley. Nevertheless, small pleasure steamers serve parts of the upper Meuse and Ardennes areas during the summer months. The through freight rates between the ports of Belgium and North-east France by the Meuse are ten times as great as by the Rhine.

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2. The Course of the Meuse through the Ardennes

After leaving the relatively low country near Charleville and Mézières the Meuse flows in a deeply entrenched valley through the Ardennes plateau. This plateau is the worn-down stump of the early Armorican folds, some of the earliest mountains in Europe. A gradual elevation of the old mountain stump across the course of the river has not prevented the Meuse from maintaining its course and gradually forming a deep gorge, though the tributaries in the Ardennes are young and shallow and more suitable as sources of power than as means of navigation.

Wherever softer rocks occur the river meanders, forming in the bends small alluvial plains where cultivation has given rise to the only settlements, the little towns being built on the rocky thresholds of the loops in the river. The valley is nowhere wide enough for large-scale cultivation, and the fields, meadows, and gardens merely supplement the imported food-supplies, which are paid for by the products of the small iron and timber manufactures, especially between Monthermé, Revin, and Fumay. Beyond Givet the valley widens out as the crystalline rocks give place to old limestones. The forest thins out, and the valley, being wider, supports a denser but still scanty population. The surface of the limestone plateau is arid pastureland. As the Meuse trench has always been a route across the plateau, it is lined by a chain of fortresses, such as those at Dinant and Namur.

3. The Sambre-Meuse to Maastricht

The Meuse is still a plateau river when it joins the Sambre, and it does not become a river of the plain until it reaches Maastricht. South of Namur there is practically no river traffic, but from Namur to Jupille it crosses an industrial region and becomes a broad highway which carries the produce of mines, quarries, and factories until it enters the Herve plateau, to the north-east of Liège. From being a gully more than 300 feet in depth at the confluence with the Sambre the valley opens out, and the rate of fall is halved.

BELGIUM: PHYSICAL CONDITIONS

At Liége the river receives the waters of the Ourthe and its tributaries, and again widens, so that by the time it reaches Maastricht it is half as wide again as at Namur.

4. The Maas Plain of the Lower Meuse

Between Liége and Venloo the gradient of the river-bed varies. The fall of two feet per mile between Liége and Eysden increases to three feet per mile as Maastricht is approached, and the depth decreases from seven feet to two feet, making navigation impossible. These variations correspond to variations in geological structure, and it has been necessary to construct a lateral canal between Liége and Maastricht. Beyond Maastricht the Meuse is again navigable, but as there is no through passage for large barges above that town there is little traffic on the lower Meuse. At the outbreak of the War schemes were afoot for the deepening of the Maastricht-s'Hertogenbosch and Liége-Maastricht canals to allow the passage of 1000-ton barges, but they have not been carried out.

The Sambre is the most important tributary of the Meuse. It rises in the neighbourhood of Landrecies, in France, and flows in a relatively narrow valley through Maubeuge to Charleroi, where it begins to widen. Throughout its course in Belgium it is navigable, though its windings have made canalization necessary. Above Namur its fall is slight, and its banks form low-lying meadows on which cattle are pastured. At Charleroi it receives two small streams, which maintain a navigable depth for large barges below that town. The Semois drains the western part of the Belgian Ardennes. It is navigable from Herbeaumont, but though picturesque its countryside is barren, and possesses neither commercial nor industrial importance. The Ourthe rises near the border of Luxemburg, and drains the eastern part of the Ardennes. It is not used for commercial traffic until it reaches Angleur, where the Vesdre enters. The Vesdre flows from the Eupen district, and is very shallow and swift. Its valley is highly industrialized, and contains a number of small but important towns where tributary streams enter—

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e.g., at Eupen, Limburg, Verviers, Pepinster, and Chênée. These towns have both textile and metallurgical industries, and though the river flows through picturesque country the water is fouled by wool-washing. One of the tributaries, however, is the Hoegne, which receives the clear Eau de Spa, the famous medicinal baths.

Several tributaries drain the Campine and Dutch Limburg. The Gheule rises in the Belgian zinc district of Moresnet and Bleyburg, and flows through Dutch Limburg to the Meuse. Unfortunately it is not navigable. On the west bank of the Meuse the little river Bos rises near Asch, in the Campine. At present it is of no importance, though its valley may eventually be utilized for one of the projected Campine canals. The Roer rises in the Hohe Venn, and includes within its basin the towns of Aachen, Düren, and Jülich. It drains the Aachen coalfield, but is not navigable beyond Odilienburg, near its mouth at Roermond. The Niers rises in low-lying country in the Gladbach-Krefeld district and flows as a small stream through the wide valley which lies to the east of Gladbach. It is connected with the Rhine near Neuss (Düsseldorf) by means of a small canal, and with the Maas by a second canal from Geldern to a point near Oijen, on the north of Venloo, the virtual limit of commercial navigation on the Maas. The Niers finally enters the Maas at Gennen.

ECONOMIC SUB-REGIONS

1. The Coastal Plain

(a) The dunes consist of sand which has been driven up the beach by the prevailing winds. The soil is consequently very porous and unfertile, and in its unimproved state is loosely held together by the roots of coarse grasses. The climate is rather extreme because of the exposed situation, and rather dry because the dunes are too low to cause condensation from passing winds. Nevertheless, the population has succeeded in cultivating rye and potatoes in the neighbourhood of the coast towns by the lavish use of horse and fish manure supplemented by artificial nitrates from the coalfields. Rye is sown after the potatoes have been gathered,

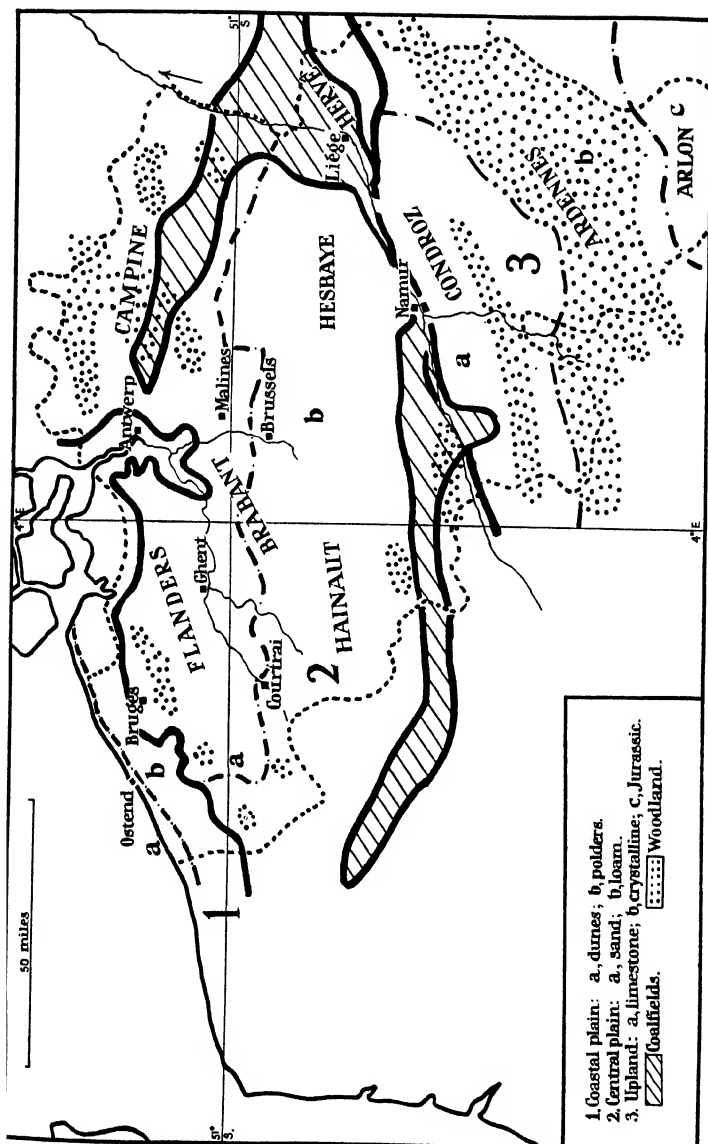


FIG. 34. ECONOMIC SUB-REGIONS OF BELGIUM

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and the straw is used to protect the spring sowing of potatoes during the winter months. In the immediate neighbourhood of the coast towns peas, cabbages, and salad vegetables are grown for the use of summer visitors. The people of the coast work on the farms of both the dunes and the polders during the summer, many of their homes being let to summer visitors.

(b) The polders are drained marshlands with a surface soil of clay, and lie at or below sea-level. The land is cultivated where it is not too marshy, wheat, barley, and peas being grown as cash crops, and oats as forage. Potatoes are grown both for sale and for the use of stock. Beet is also widely grown, but flax is not so important as formerly. The chief use of the polders, however, is as pasture for dairy cattle, and both dairy and sugar industries are important. There are many breweries. The people of the farms of the polders are much more isolated than those of the dunes, but they are faced with a common problem, that of drainage. As a result, they have found it necessary to combine in the numerous associations for co-operative effort in dealing with the water-channels. These drainage groups are called *water-inguies* (cf. Holland). The chief town in the dunes is Ostend (44,000 inhabitants, in summer 140,000), which has existed as a fishing centre since the ninth century. It has frequently been destroyed by war, and by 1800 had become one of the most strongly fortified ports in Europe. During the early nineteenth century it had daily packet services with London, and at a later date with Dover. The increase in the size of vessels caused it to become less important for goods traffic—e.g., in linen—and at the present time access to the harbour is not easy for vessels of more than 2000 tons. Nevertheless, it is still the principal port of the Belgian coast, and handles nitrates imported from Norway, timber from the Baltic, and coal from England. Its railway connexions with all parts of the Continent make it the principal packet-boat and mail station for traffic between Britain and Belgium. It still relies to a considerable extent on its fisheries—e.g., oysters—but its modern importance is as a summer tourist resort. There are several local industries, such as salt-refining, rope-making, brewing, soap, lace, and voile manufactures,

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Blankenberghe, Heyst, and Knocke are villages which are becoming increasingly popular with summer visitors (*cf.* Scheveningen and Domburg, in Holland). Nieuport was formerly the outport of the Yser and the ancient port of Ypres, but is only slowly recovering from the damage caused by the War. Zeebrugge is the railway port for England, whole trains being shipped by train-ferry to Harwich. It has regular services with Grimsby, Hull, and Goole, and has developed metallurgical industries. Its importance is due to the construction of the Zeebrugge-Bruges Ship Canal, which is twice as deep as the Ostend-Bruges Canal, which it superseded. In order to avoid the silting up of the mouth of this canal a very long breakwater, the "Mole," was built to check the tidal drift from the west (*cf.* Tynemouth), but the partial destruction of this pier during the War has made expensive dredging necessary. The canal allows Bruges to retain an overseas trade, the tonnage of the port of Bruges having increased from 300,000 in 1913 to 647,000 in 1924.

In the polders the towns of the south are small, while those of the lower part of the Escaut basin owe more to that river than to their local agriculture. Furnes (7000 inhabitants) is an agricultural market for the butter, cheese, and beer produced locally. At the beginning of the nineteenth century it was the chief market for Belgian linen because it was linked with both Ostend and Dunkirk by canal. In the northern towns there are more people who find occupation in the rope-works, canvas, jute, hemp, and cotton mills, and timber yards, which owe their existence to the ease of communications with Antwerp. Boom (18,000 inhabitants) also uses the clays and brick earths of the Rupel and Escaut in the manufacture of bricks and tiles, which are used in the waterside towns of Belgium and Holland, and are being increasingly exported to England.

2. The Plain of Central Belgium

(a) The sandy plain ('Flandre sablonneuse') has a clay subsoil, but the surface is mainly sandy, and is often waterlogged as the slope of the ground is very slight. With a

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rainfall 50 per cent. greater than on the coast the country is wooded and contrasts with the somewhat monotonous polder-lands. The cultivation is that of the forest clearing rather than of the open arable lands of the 'limoneuse' soils. Two types of soil and vegetation may be distinguished. The northern sandy area consists of barren heaths, except in the Pays de Waes, where the sands have been transformed into rich agricultural country. In the south limons and sands are mixed, and cultivation is consequently easier. Deep borings, however, are necessary for a supply of pure drinking water since the surface waters are stagnant. In the best soils potatoes are grown both for local consumption and for export. Rye is grown for local consumption, with oats, barley, wheat, rape-seed, beet, flax (declining), and chicory, the latter being important in Nevele. Along the watercourses and marsh pastures cattle are kept, but the only kind of cultivation which is really profitable is intensive spade-work in gardens, and it is generally possible to find the Belgian peasants, both men and women, working in the fields and gardens from early morning to sunset. A change is gradually taking place, whereby the traditional products—flax, chicory, and colza—are giving place to more remunerative crops, especially those used as food for cattle. Thielt, for example, was formerly a centre for flax, but is now important as a butter market. Poperinghe is a centre for cattle and Bellem for pigs, the lard being exported to England. There are numerous horse fairs. Eggs and rabbits are exported through Ostend. Sugar-refining, brewing, and distilling are general, and there are many co-operative dairies.

In spite of the poor soil population is dense, and averages 500 persons per square mile, but agriculture is seasonal, and there is a large seasonal migration of about 40,000 to 50,000 of the workpeople. Thousands go to work in the industrial areas of Hainaut and the new coalfield of the Campine. Everywhere the supply of drinking water is a great problem, and there are no less than 5000 wells at Saint-Nicholas-Waes, while in the little red-tiled village of Ertvelde, which has only 674 houses, there are 630 wells.

Bruges (51,000 inhabitants), where the Roye river formerly

BELGIUM: PHYSICAL CONDITIONS

entered the Zwyn inlet, was the principal port south of the Rhine mouth in the Middle Ages. During this period none of the North Sea ports of Belgium was safe when the westerly gales were blowing, so that the sheltered position of the harbours of Bruges and the strength of its castle, which protected it from piratical raids, made that town an important trade centre and the commercial metropolis of Burgundy. Its possession of the phial of the Sacred Blood made it a great pilgrimage centre. The silting up of the Zwyn and the civil wars of the sixteenth century drove the trade of Bruges first to Antwerp, and later to Amsterdam, but, in spite of its distance from deep water and from coal, its manufactures of lace, china, and woollen and linen cloth were retained. The civic pride of its people, descendants of the burghers who freed Flanders from foreign overlords in the fourteenth century, is revealed in the desperate efforts made to regain access to the sea. The construction of railways and canals, and, above all, of the Zeebrugge Ship Canal, has allowed commerce to revive on a small scale. As the medieval buildings and Renaissance treasures of Bruges are in an excellent state of preservation, they attract large numbers of tourists and painters.

Ghent, or Gand (with suburbs 211,000 inhabitants), lies at the junction of the Lys and the Escaut, the two principal navigable rivers of Belgium. Founded in Roman times, it was a place of some importance during the Danish invasions, and was the industrial rival of Bruges. Its energies were expended in the development of the unfertile sands of the Pays de Waes, where Flemish industry converted heathland into fields of wheat, madder, flax, and tobacco, afterward replaced by vegetables and orchard fruits. As the Lys is pre-eminently the flax river of Flanders, the lowest bridge-town naturally became the principal linen-manufacturing centre, and the skill thereby obtained gave rise to woollen, silk, and lace industries, the textiles being exported to all parts of Europe. The Napoleonic wars interrupted normal conditions, and large numbers of refugees crowded into the town from the country (population in 1820, 58,000). This established a large surplus population, a condition favouring the development

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of large cotton-mills using child labour. Ghent was one of the earliest towns in Europe to set up power-looms, and has remained the chief cotton- and linen-manufacturing town in Belgium. Like Antwerp, it suffers from the estuary of the Escaut being in the hands of the Dutch, who also hold the entrance of the Terneuzen Canal. Though it has chemical and metallurgical industries it relies entirely on the manufacture of raw materials imported through the Escaut.

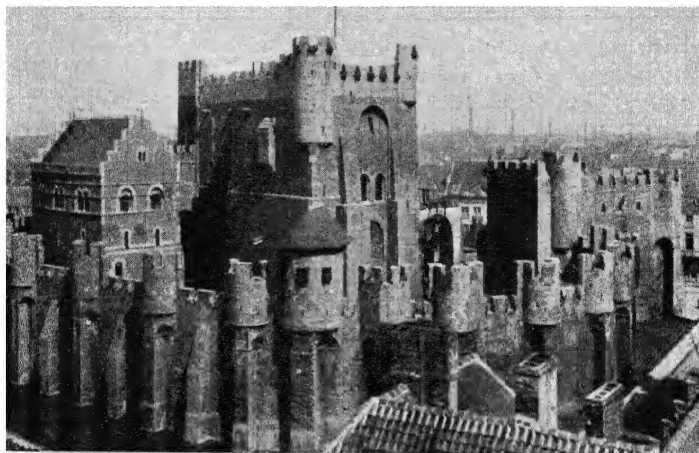


FIG. 35. CASTLE OF THE COUNTS AT GHENT

The castle, built in 1180, lies at the heart of the industrial city of Ghent.

By courtesy of the Belgian State Railways

Ocean-going vessels have become much larger, but Ghent still retains a considerable amount of sea-borne commerce, the docks dealing with between one and a half and two million tons each year. The town's manufactured goods, however, are usually sent to Antwerp for reshipment overseas.

To the east of the Scheldt the Campine is still largely composed of badly drained unfertile sands, which are covered with marshes, pine-woods, and sheep pastures. Its climate is more extreme than that of the country on the west of Antwerp, largely because of the nature of the soil, but in

BELGIUM: PHYSICAL CONDITIONS

some districts irrigation has led to an improvement in the quality of the soils, particularly along the banks of the Campine canal in the Neer-Oeteren district, and it is probable that the area under cultivation will be increased as the coalfield develops. In the neighbourhood of Antwerp buckwheat, wheat, barley, and beet, carrots, asparagus, peas, and cauliflowers are cultivated, and potatoes and oats are widely grown in other districts, the grassland being used as cattle pasture. It is on the southern edges of the district, however,



FIG. 36. QUAI DES HERBES, GHENT

During the Middle Ages this was one of the largest inland harbours.

By courtesy of the Belgian Legation

that agriculture is most important, and Malines and Louvain specialize in pears for sale in Brussels and for use in the preserving factories. In the north of Brabant dairy cattle have been introduced, but neither sheep nor pigs are important, and though co-operative farming is on the increase beef and eggs remain two of the principal farm products. Taken as a whole, the Campine is nearly as poor as the Ardennes.

Malines, or Mechlin (61,000 inhabitants), at the junction of railways from Antwerp, Ghent, Liège, and Brussels, is the principal town, and, in addition to its specialized garden produce, has woollen and cotton-spinning and lace industries.

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Gheel and Genck are the centres of the mining region, and it is this neighbourhood that an industrial centre of the type of Charleroi will develop. Maesyck, on the Maas, is separated from the rest of Belgium by the whole width of the Campine, and, as a result, hardly enters into its economic life. It manufactures leather and cigars. Hasselt (18,000 inhabitants) is the chief town of Belgian Limburg, and was an unimportant cattle market, with local breweries, before mining was begun. As it has to provide accommodation for the workmen who go daily by train to the mines, it may become an important dormitory town.

Antwerp (300,000 inhabitants), which lies on the concave bank of the Escaut, about fifty miles from its mouth, is the national port, and at the present time owes little to the sandy tracts of the surrounding countryside. Unlike most of the ports, the strength of the river current has kept its banks free from silt (*cf.* Hull). Moreover, the mouth of the Scheldt is kept clear by the tidal drift which carries the silt of its estuaries northward toward the northern outlets of the Rhine and Zuider Zee. During times of peace it has always been the best place for overseas commerce in North-west Europe, and during the quieter centuries of the later part of the Middle Ages it became a great centre of Hanseatic trade. By the sixteenth century Antwerp had a population of 200,000 people, and was the chief port in Europe.

Antwerp's great disadvantage, however, is that it is not easy to defend, and if taken from the land side the opposing forces are generally able to blockade it so that its trade is injured. Thus its capture and spoliation by Spain in 1576 caused the Northern Provinces to establish a blockade, so that its trade dwindled and that of Amsterdam increased. By 1820 Antwerp had only 60,000 inhabitants, and the modern port dates from 1839, when the Scheldt was reopened for navigation. Throughout the latter part of the nineteenth century Antwerp grew in importance, and was one of the chief ports of Europe at the outbreak of the World War. Between 1914 and 1918 it was held by Germany, and was blockaded by the Allies, to the great advantage of Rotterdam, which was in neutral territory.

BELGIUM: PHYSICAL CONDITIONS

There are two ports—the riverside port, where three miles of quays are equipped with hydraulic cranes which load goods straight from the holds of steamers into railway trucks, and the inner port, which possesses warehouse accommodation for the storage of timber, grain, coal, fruit, colonial produce, and raw materials of every description. The grain dock is connected by canal with the Meuse, and new canals

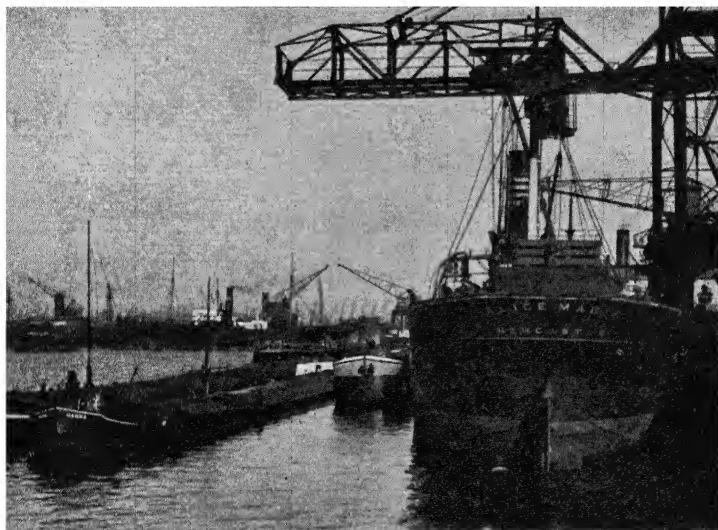


FIG. 37. ANTWERP DOCKS

Note the large barges used for shipping the coal imported from Newcastle.

By courtesy of the Belgian State Railways

are being opened up with the Campine coalfield. The mechanical equipment is everywhere excellent, and the splendid distributing and collecting facilities make Antwerp pre-eminently an *entrepôt* port where goods can be quickly and cheaply handled. The principal imports consist of cereals, coffee, cocoa, tea, cane-sugar, fruits, wines, spices, cheese, fish, textiles, rubber, coal, mineral ores, and petroleum. The exports consist largely of manufactured goods—*e.g.*, machinery, cloth, chemicals, pottery, cement, pigments, glass,

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oils, sugar, leather, paper, and furniture—while considerable quantities of potatoes, eggs, grain, and margarine are sent to Britain and Germany. There is a large transit trade in coal.

The opening of the Campine coalfield should enhance the importance of the manufactures of Antwerp—flour, metals, etc. If the proposed Rhine-Antwerp Canal is constructed Antwerp's share of the trade of the Rhine will be very much increased, but it should be noted that the Dutch have refused to ratify the agreement which would enable this canal to be built across Dutch territory, because it would adversely affect the position of Rotterdam, the bulk-cargo transit port of the Rhine.

(b) The loam plain ('limoneuse') lies to the south of the line Maastricht-Louvain-Alost-Courtrai-Ypres, which marks the southern boundary of the sandy plain. The loam plain is actually a low plateau forming undulating country between sixty and 600 feet above sea-level. Here and there are a few isolated hills which rise above the general level, but communications are easy in all directions. The climate is more rigorous than that of the coast, but less cold in winter than that of the Campine. The summer is warmer than that of the coast, a condition that accounts for the greater output of wheat.

As in most districts where limons occur, there are considerable differences between the surface soils of the different districts. Hesbaye is the most fertile area, and throughout the region between Maastricht and Thuin, on the Sambre, there are excellent crops of wheat and sugar-beet. Elsewhere the subsoil consists of alternate layers of sand and clay. On the whole the limons of the east are more permeable and fertile than those of the west, but all the soils contain fertile elements, and though the addition of manure is necessary cultivation is easy. In the Borinage, Centre, and Charleroi districts potatoes are grown for local consumption and barley is grown in the east of Hainaut, Brabant, Namur, and Hesbaye. Sugar-beet is grown everywhere because of the dense population, which supplies cheap labour. In West Flanders roots are grown as winter food for cattle, the prin-

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principal centres for potato export being Flanders and Limbourg, which are not so densely peopled.

Flax is important at the present time in only a few districts of the south-west, colza is grown along the Dendre, hops between Poperinghe and Alost, tobacco in Flanders (Ninove and Grammont being especially important). Osiers are grown along the Meuse, and are sold for the manufacture of margarine cases in Holland. Several districts are important for apples, cherries, and plums, each district specializing in the crops for which it finds the best market. There are, however, considerable areas where grass is cultivated for pasture, cattle being fattened and milk produced in all districts. Horses are important in East Flanders, Hainaut, and Brabant, and pigs are reared chiefly in the grain districts. The low-lying areas produce poultry, ducks being especially important at Laplaigne, where earthworms are particularly numerous. Sheep are found in only one district, Mons, which produces wool and mutton. In other districts an occasional sheep may be tethered at the side of a ditch, but there are no flocks. Sheep are kept only where other forms of farming are relatively unprofitable. The area allotted to sheep-grazing is therefore an index of the area of waste land, and it is probable that the 'limoneuse' region of Belgium is the most intensively cultivated district in Europe. Because of the fertility of the soil and the existence of coal in the neighbourhood, agricultural industries are carried on in most districts. Sugar-refining is very important, the chief refineries being at Wanze (Huy) and at Tirlemont. The co-operative dairy system is being developed, and butter and cheese are sent both to the industrial districts and abroad. In Hainaut the breweries are also run on co-operative lines. In the Looz district, in the south of Limburg, there is no local market for the fresh fruit produced, and no less than 150 works are engaged in the manufacture of syrups. Chicory-drying is carried on in the neighbourhood of Roulers and Courtrai and in several towns which lie just outside the region of loamy soils. Flax-retting is, strictly speaking, an industry of the more westerly parts of Belgium, where 12,000 persons are engaged in the flax-works

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which extend from Éstaires, in France, as far as Deynze. In the east, along the valley of the Geer, there are several thousand workers engaged in the straw-plait and straw-hat industry between Glons and Sluse.

Brussels (with suburbs 833,000 inhabitants) is pre-eminently a nodal town at the junction of forest and plain at the point where two islands in the river Senne facilitated the building of bridges. It was a walled town at the beginning of the nineteenth century, and, besides being the capital, manufactured fine lace. It was a road centre for Aachen, Amsterdam, Liège, and Lille, and has canal communications with Antwerp. With the building of railways its importance has greatly increased, engineering and metallurgical industries being specially important. It is also a canal port, and prior to the War there were intentions of making it a sea-port by deepening its canal along the Senne valley.

Poperinghe (13,000 inhabitants), in the hopfields, was an agricultural market town before 1914, but during the War it became the great forward base of the British armies in Flanders and an important railway centre. In pre-War days it had a small woollen industry. During the War it housed hundreds of thousands of troops, and was the centre from which several armies were supplied. After the War the withdrawal of the troops caused it to lose its importance, though it still possesses a considerable tourist traffic.

Ypres (17,000 inhabitants) was the lowest bridge-town of the Yperlee during the Middle Ages, and, being one of the outlets of the flax region, became almost as important as Bruges and Ghent. The silting up of the river caused its overseas trade to decline, and by 1820 its population had fallen to about 15,000. Nevertheless, it was still an important local market for cloth, serge, ribbons, and thread. By 1914 it was little more than a local market whose architectural remains attracted a number of summer tourists. Its almost complete destruction during the War has been followed by a vigorous revival, and it has become an important pilgrimage centre because of the enormous casualties which the contending armies suffered in its immediate neighbourhood.

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Courtrai (38,000 inhabitants) is the chief centre of the flax industry in the south of the Lys valley. The finest flax in Europe is grown in its immediate neighbourhood, and it has become the principal flax-spinning town in Belgium. Lace and linen are also manufactured, and there are local tobacco and leather industries. Louvain (40,000 inhabi-



FIG. 38. THE INTERIOR OF A BELGIAN CONVENT

In spite of the dominance of machine-made textiles the old handwork industries—lace and embroidery—are still fostered by the Roman Catholic Church in numerous convents in Flanders.

By courtesy of the Belgian State Railways

tants) was celebrated for its cloth manufactures in the fourteenth century, when its population was comparable with that of Ghent, but the tyranny of the Dukes of Brabant caused it to be deserted by the clothiers. Napoleon suppressed its Catholic university, but with the construction of railways it became a railway centre, and its university was in a flourishing state before the War. In 1914 a great part of its beautiful university buildings, including the library, was destroyed, but the town is now recovering, and possesses

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important corn, chemical, and brewing industries. Tournai (35,000 inhabitants) is the principal woollen-manufacturing centre, and other towns in the south of Belgium manufacture paper, artificial silk, matches, and agricultural implements. Sufficient details, however, have been given to show that there is a wide diversity of agricultural life throughout the south of the Belgian plain, and that this diversity is an important factor in creating stable economic conditions whereby surplus labour can be readily absorbed in the factories—*e.g.*, the beet-sugar refineries, which give employment during the winter months.

The Hervé plateau differs in some respects from the other parts of Southern Belgium. Its climate is similar to that of the Ardennes, while its soil consists of clay, which overlies the chalk. There are several parts where outcrops of schists, grits, and marls occur, and it is largely a pastoral district. Because of its distance from densely populated markets it exports its surplus milk in the form of cheese and butter. Eggs and pigs are also important, and leather is manufactured. The most fertile areas are under sugar-beet, and the valleys have fruit-trees. In consequence it carries on sugar-refining and syrup manufactures. It suffers from the existence of the tariff frontier, which largely excludes its products from the markets of the Dutch and Aachen coalfields, which are quite close to it.

3. The Belgian Uplands

(a) The Condroz limestone region lies to the south of the Sambre-Meuse and Vesdre valleys and north of the line Chimay-Beauraing-Nassogne-Ferrière-Pepinster. Being on the plateau, the nights are much cooler than in the plains (*cf.* the Hervé plateau). As it is both cooler and damper, rye is the chief cereal, though where there are patches of better soils lying in sheltered situations both oats and wheat are grown. Potatoes, beet, and grasses are cultivated as fodder crops, and stock-rearing is fairly general. As in the Hervé plateau, fruit-trees are grown.

(b) The Belgian Ardennes are similar to those of France

BELGIUM: PHYSICAL CONDITIONS

in that their elevation, which averages about 1250 feet above sea-level, makes cultivation practically impossible except in the valleys. The climate is severe, being cold and wet throughout the year. What little cultivation there is is carried on in the valleys, below the 1000-foot contour, and forests of oak and pine cover large areas. The heaths and natural grasslands are used both for the fattening of cattle and for milk. The forest industries include the production of charcoal and the manufacture of sawn timber and pitprops. *Sabots* and casks are made, and there are small tanning industries. There is only one town of more than 5000 inhabitants. This is Spa (7600 inhabitants), which owes its relative importance to its mineral and thermal springs.

(c) The Jurassic region of Arlon occupies the south of Luxemburg and the south-eastern extremity of Belgium. It is of lower elevation than the rest of the uplands, and has a much milder climate than the Ardennes. Nevertheless, the winters are cold, with much snow. On its undulating hills rye and oats are grown, though potatoes are the most important crop. In sheltered parts both in Belgium and Luxemburg tobacco is cultivated. As at Freux, in the Ardennes, use is made of the streams for fish culture. The towns of Arlon are much larger than those of the Ardennes, Arlon itself having more than 12,000 inhabitants. Most of the population is concentrated in the iron-manufacturing centres of Halanzy, Musson, Messancy, Aubange, and Athus. The iron-mines are now practically exhausted, but the iron and steel industry lingers because of the nearness of the more important iron centres of Luxemburg and Lorraine.

The annexed districts of Eupen and Malmedy were developed by Germany, tanning being carried on at Malmedy, together with confectionery and paper industries. Luxemburg has similar conditions to those of Arlon, though its more sheltered situation allows it to share in the vine cultivation of the Moselle valley. During the sixteenth century both Arlon and Luxemburg formed part of the Spanish Netherlands. This old duchy of Luxemburg became part of Holland at the beginning of the nineteenth century, Arlon being separated after the secession of Belgium in 1830. The

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separation of Holland and Luxemburg was gradual. In 1867 Luxemburg became an independent state, but its personal connexion with the King of Holland remained till 1890. After Waterloo it became part of the German Confederation, and formed part of the German customs union till 1914. It has, however, joined the Latin Monetary Union, though formerly German coins were freely current. After the World

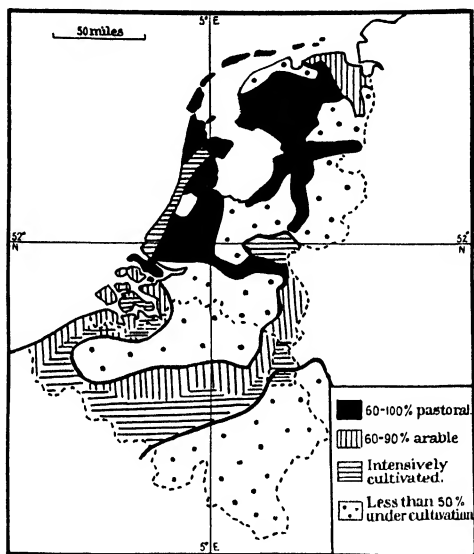


FIG. 39. AGRICULTURE IN BELGIUM AND
HOLLAND

Note how the character of the agriculture reflects the nature of
the physical conditions outlined on page 192.

War its separation from Germany was made complete, and it has since entered into close commercial relationships with Belgium and France. It is an excellent case of the overlapping of Teutonic and Latin influences. Its people are of German stock and commonly speak a German dialect, though French is also an official language. Most of its people are Roman Catholic, with French sympathies, but are unwilling to enter into a military alliance with any other country.

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SUMMARY OF AGRICULTURAL CONDITIONS IN BELGIUM

Of the total surface of Belgium 3 per cent. consists of polder, 28 per cent. of sands, 38 per cent. of loams, 19 per cent. of limestone, 14 per cent. of crystalline schists, and 3 per cent. of marl. Two-thirds of the area is arable, one-fifth is forested (chiefly in the sandy and schistose districts),

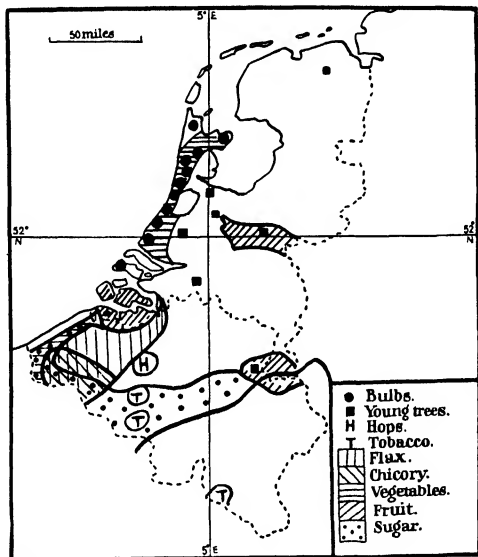


FIG. 40. INDUSTRIAL CROPS OF BELGIUM AND HOLLAND

gardens occupy 9 per cent., and 6 per cent. is waste. Rye, oats, wheat, and barley are the chief grains, peas and beans being grown in rotation. One-tenth of the arable area is under potatoes, considerable quantities being exported. The industrial crops include hemp, flax, hops, chicory, colza, sugar-beet, and tobacco. Fruit-trees are the basis of the syrup and vinegar industries.

Of the pastoral products cattle are the most important, two million cattle being kept. Of these one and a quarter millions are dairy cows, and the tendency is for milch cattle

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to become still more important, small quantities of frozen and chilled beef being imported from the Argentine and Australia. Pigs are chiefly kept in the grain districts and in the regions bordering the Ardennes forests. Poultry are most important in the grain districts, and there is a large export of eggs. Bees and sheep are confined to the waste lands, and there is a considerable export of honey.

The agricultural industries are those chiefly concerned with the production of sugar, dairy produce, beer, and spirits. Agricultural development is fostered by the State, the agricultural institutes being widely distributed, and there are schools of brewing and sugar-refining. Besides these State institutions there are numerous co-operative societies for organizing and financing the sale of agricultural products.

CHAPTER XIII

THE LOW COUNTRIES: BELGIUM—MINERALS AND ECONOMIC DEVELOPMENT

AT the end of the eighteenth century there were two strongly contrasting regions in Belgium, the hill country, where the somewhat backward, dark, round-headed Walloons carried on small metal industries in order to supplement the income of their poor farms, and the coastal plain, where the fairer Flemish folk had lived as farmers and weavers for many centuries. Between these zones the rich plain of Central Belgium formed common ground for the two races. The forests which formerly divided the country have almost disappeared, but the two groups still remain, and the Roman Catholic, art-loving, and conservative Flemish look to Ghent and Louvain for their distinctive culture, while the more radical and iconoclastic Walloons regard Liège as their regional capital. The opening up of the coalfields which bound the central plains has tended to bring the races together, and bilingualism is growing in the towns. It is probable that, given wise government, twentieth-century Belgium may achieve national unity.

In less than a century Belgium has been transformed from a poor agricultural into a rich industrial country. At first the total amount of power consumed was less than is now produced in a single industrial works, such as the Cockerill establishment at Seraing, and it was not until after 1830 that machinery began to revolutionize industry. The industries were all of a small-scale and domestic character, but, nevertheless, gave employment to large numbers. There were 400,000 peasants in Flanders engaged in the manufacture of linen. In Bruges alone there were thousands of lace-makers, while in the south there were no less than 11,000 Walloon blacksmiths working as nail-makers. In the

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whole of the glass, iron, and textile industries, however, there were less than 200 small machines.

After 1830 capitalist societies and joint stock companies were formed to operate the colliery and metallurgical industries, and about this time the development of power machinery in Great Britain led to a great crisis in the linen industry of Belgium, so that only those centres which had established machine industries were able to survive. The consumption of coal in Belgium rose rapidly to 8,250,000 tons in 1856, and from that time industrial development was continuous and general. By 1902 750,000 horse-power had been developed for industrial purposes, and the increase of population with the opening up of the coalfields and the iron- and zinc-mines was continuous. Above all, this rapid development was due to the extension of the means of communication, and since the World War the recovery of Belgium has been relatively greater than in any other European country. The prospects of the future are particularly bright, provided that peaceful development can continue.

THE BELGIAN COALFIELDS

1. The Franco-Belgian and Sambre-Meuse Coalfields

The Franco-Belgian coalfield stretches in a series of basins from Fléchinelle and Arras, in Northern France, to Liège. There are outliers in Aachen and Krefeld, and to the east of the Rhine lies the Ruhr coalfield, the mainstay of German prosperity. To the north of the Sambre-Meuse coal reappears below the surface in the Campine and Dutch Limburg at depths which are accessible for modern mining.

(a) *The North French Coalfield* (see p. 108). Note that Anzin, Aniche, Béthune, Dourges, and Lens produce blast-furnace coke and that the French steel industry is found near these places and near Maubeuge. The output in 1913 was 29,500,000 tons, and this figure is rapidly being approached at the present time.

(b) *The Borinage or Mons coalfield*, in South-west Belgium

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('limoneuse'), is the most important coal-producing area in that country because it possesses every type of coal and its reserves are greater than those of the other basins. The coal varies in quality from gas coal to semi-anthracite. In 1910 the Borinage produced 4,700,000 tons, about a fifth of the total output of Belgium. The coal seams are found at great depths, and extend downward to between 8000 and 10,000 feet below sea-level. The mines are the deepest in Europe,

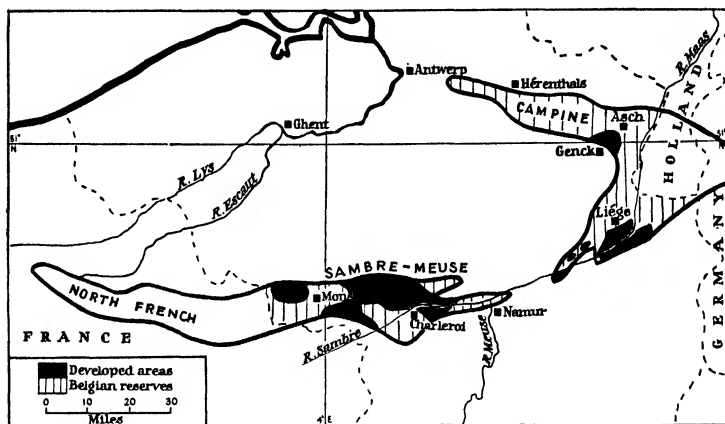


FIG. 41. SKETCH MAP OF THE BELGIAN COALFIELDS

the workings extending to below 4000 feet. Mons (27,000 inhabitants) is the commercial centre of the Borinage, and is situated at the foot of Mont Panisel, where a bridge crosses the Trouille, which drains into the Haine and the Escaut. Canals connect it with (i) Condé, on the Escaut, and thus with France, (ii) the Escaut and Dendre, and thus with Antwerp, and (iii) the Centre coalfield (La Louvière) and Charleroi and Brussels. It is therefore well situated for the export of coal to all parts of Belgium and North France. Before the War Belgium exported 6,000,000 tons of coal to Maubeuge, Lorraine, Luxemburg, and Pays Bas, chiefly from the Mons district. There are a number of other towns near Mons which use their coal in local manufactures—

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e.g., Saint-Ghislain's refractory material and glass and the porcelain of Baudour.

(*c*) The *Centre coalfield* is less deep (4200 feet). Its chief centre is La Louvière, which manufactures iron. As these coalfields are in the loam plain, agriculture as well as mining and metallurgical industries are carried on. Binche (11,500 inhabitants), at the junction of the agricultural and mining districts, has an important horse fair.

(*d*) The *Charleroi basin* formerly had the greatest output, but its reserves are small, the present output of coal being about 3,500,000 tons and of iron 760,000. The presence of glass sands has given rise to an important glass industry, which provides work for between thirty-five and forty factories. Charleroi (28,000 inhabitants), at the junction of three rivers, is the centre of a highly industrialized district, and has direct canal communications with Brussels. Coal, sand, marble, and chalk are obtained in the neighbourhood, and iron, zinc, and glass are manufactured. More than a quarter of a million people find work in the immediate neighbourhood.

(*e*) The *Basse-Sambre* and *Namur basins* are shallow, and the coal output is less than in the other fields, but there are several old industries which were established when this was the chief area of outcrop mining—*e.g.*, plate glass. The old fortress town of Namur (31,000 inhabitants) is built on a rock commanding the junction of the Meuse and Sambre. It is the agricultural market for the district, and has brewing and cutlery industries.

(*f*) The *Liège basin* has a great variety of coals, but its reserves are small. Lying at the junction of the Ourthe and Vesdre with the Meuse, Liège (168,000 inhabitants) is a natural route centre, and was probably chosen as a Roman fortress because of its command of routes into Germany. More than a century ago it was important for the making of metal goods, textiles, paper, and glass, and it has since become the most important centre in Belgium for steel and steel goods. The coalfield produces about 5,500,000 tons, the anthracite being exported to Paris. It also imports about 3,000,000 tons of German coal for use at Verviers and

· BELGIUM: ECONOMIC DEVELOPMENT

other places along the Vesdre valley. Its most important suburb is Seraing (38,000 inhabitants), where the Englishman Cockerill was allowed to establish ironworks in 1817 in the *château* of the Prince-Bishops. The first Belgian steel-works and coke-ovens were erected here. Two French glass-makers introduced the manufacture of table glass in the old abbey of Val Saint-Lambert, which is now one of the greatest glass-works in the world. Liège itself has developed cycle and motor-car manufactures, and its old arms industry is still important. It is surrounded by small industrial towns possessing mines and quarries and pottery, glass, zinc, lead, paper, and chemical industries, while there is a growing electrical industry at Flemalle. The Vesdre valley, which is linked with Liège in its industrial and commercial life, owed its early industrial development to the quality of its water for textile manufactures—washing, spinning, weaving, and dyeing—power being obtained from the local streams. Verviers (41,000 inhabitants, with suburbs 80,000) is the principal town. It supplies the Near East and parts of America with woollen goods and has developed the manufacture of cotton and artificial silk. Its minor industries include iron and copper, shoemaking, and the manufacture of cardboard boxes. Pepinster and Ensival share the industries of Verviers, while Eupen (15,000 inhabitants), in the medicinal spa district at the head of the Vesdre valley, also manufactures drapery and makes dyes and soaps.

To the north of the Vesdre lies the principal zinc-mining district of Belgium. This region was opened up about the beginning of the nineteenth century, when Abbé Dony discovered a method of producing metallic zinc from the calamine lodes of Moresnet. The chief ore mines are at Montzen, Moresnet, and La Calamine, and the chief smelters at Angleur, Antheit, Engis, and Ougrée. Other works were opened at Forêt in connexion with the mines at Bleyburg. Until 1875, when the Slaigneaux and Bensburg works were opened, the industry was dependent on the local ores, but subsequently ore had to be imported from overseas.

The Moresnet mine still produces about 10,000 tons of blende and calamine annually, but in 1925 482,000 tons of

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ore were imported, and at the present day Belgium is responsible for the refining of about 25 per cent. of the world's supply of zinc metal (spelter). The local advantages of skilled workmanship, local ores, and an early start were not sufficient to allow the zinc-refining industry to remain permanently in the Liège area, and new works were opened at Boom, Overpelt, Lommel, and Rothem, near the tidal waters of the Escaut. Nevertheless, the Liège district is still the most important, the Valentine Saint-Coq works producing 48,000 tons of spelter annually. Belgium exports about 121,000 tons of zinc metal, and the Veille Montagne Company owns mines in Germany (Stolberg district), France, Algeria, Tunis, Sweden, Italy, Greece, Spain, Mexico, England (Nenthead, near Alston, in Cumberland), and Sardinia, where there is a special port, Porto Plana. Its electrical refining works at Viviez, in France, are used to obtain a high degree of purity. The by-products are important, and include fine silver, sulphuric acid, arsenic, aluminium sulphate, and soft lead. It should be noted that Australia's (Broken Hill, New South Wales) agreement to supply 150,000 tons of concentrates annually expired in 1925, and that both Swansea and the Mansfeld districts may require greater supplies, though it is probable that the relative cheapness of labour and technical efficiency in the Belgian zinc districts will continue to attract the Australian ores. The total coal output of the Belgian portion of the Franco-Belgian coalfield was about 23,000,000 tons in 1912, and this figure was equalled, if not exceeded, in 1926, when the total output of the Belgian collieries, including the Campine, was 25,300,000 tons.

2. The Campine Coalfield

The existence of coal in the Campine was proved in 1902, and it has been estimated that the reserves of workable coal are about 10,000,000,000 tons, a quantity three times as great as those of the Belgian portion of the Sambre-Meuse coal area. The discovery of the Campine coalfield is of the greatest importance to Belgium, as it ensures the country's continued industrial development. The first borings were

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made in the Asch district in 1910, and the limits of workable coal have been found to follow the following lines: (i) in the west, from Lierre to Oostmalle, (ii) in the south, Maastricht-Hasselt-Diest-Lierre, and (iii) in the north, though only approximately known, Maesyck-Peer-Turnhout. Beyond this northern line the coal is buried out of reach of ordinary mining, but it is certain that the region of potential development is sufficiently near to Antwerp to give rise to a great industrial hinterland close to that port.

As the overlying strata consist of waterlogged sands it was not possible to develop the mines before 1913, when the process of shaft-freezing was invented. Developments were

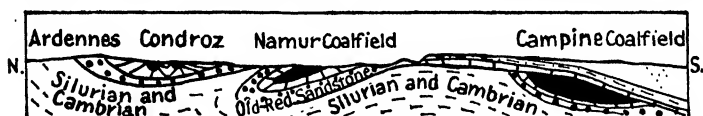


FIG. 42. SECTION OF THE BELGIAN COALFIELDS

held up during the War, but shafts are now being sunk in several districts, and especially round Winterslag and Beverloo, on the Beiringen borders of Limburg. In 1917 the coal output was 11,600 tons, but this amount has now risen to more than a million tons, and is expected to reach two million tons per annum.

The presence of glass sands in this district will probably lead to a considerable extension of the Belgian glass industry, and already copper, zinc, lead, tin, glass, radium, chemical cement, and brick industries have been started. The development of new industries has led to the construction of new railways, roads, and canals between Liège, Antwerp, and the coalfield. The effect of the opening up of the Campine field will be to lessen the demand for British coke, and, by increasing the manufacturing capacity of Belgium, to make the competition keener between Belgian and British metal and textile manufactures. Between 1910 and 1920 the population of the Campine increased by 12 per cent., a rate which compares with that of the pre-War rate of increase of the South Wales coalfield, and each day 1500 miners travel between Hasselt and Winterslag.

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One factor which limits the industrial expansion of Belgium is the high cost of production of coal (22s. 9d. per ton in 1925-26). This is due to the fact that the seams are often thin and twisted, and that the coal lies at great depths. Moreover, the danger of fire-damp makes it necessary for much of the coal to be cut by hand.

THE IRON INDUSTRY

Since the introduction of the Gilchrist-Thomas basic process in 1878 the Belgian iron-mines have lost their importance, and 90 per cent. of the ore used is imported from Luxemburg, Spain, France, Greece, and Britain.

BELGIAN IRON ORE SUPPLIES

	Metric tons	
Lorraine .	5,417,000	75.1 per cent. }
Luxemburg	1,121,000	15.7 per cent. } 90.8 per cent. minette ¹
Sweden .	530,000	7.5 per cent.
Belgium .	96,000	(brown hæmatite 1.3 per cent.)
Spain .	36,000	
Norway .	3,000	
Algeria .	1,000	
	<hr/>	
	7,212,000	

Before the War Belgium produced 167,000 tons of iron ore against 14,000,000 tons in Britain, 19,000,000 tons in France, and 33,000,000 tons in Germany.

The early iron furnaces were built at the Belgian iron-ore centres—Musson, Halanzy, Athus, and Aubange—but the deposits on the Lorraine frontier are practically exhausted, though iron industries are still carried on there. The pig-iron output in 1913 was 2,500,000 tons. More than half the furnaces were extinguished during the War, and the output in 1918 was about a quarter of a million tons. The blast-furnace industry is now stronger than ever, and the output of pig-iron is approaching 3,000,000 tons.

At the present time the principal iron-mining centres are

¹ Three and a half tons of minette ore make one ton of pig-iron.

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in the Sambre-Meuse valley, where carboniferous iron ores are still mined. The chief smelting centres are near Liège and Charleroi, while less important works are found at Châtelineau, Musson, Halanzy, Chabecq, Jemappes, and Bruges. The basic slag is used in phosphate fertilizers. There are twenty-nine steel-works, with a net export of 100,000 tons of crude steel. More than 2,500,000 tons of crude steel are retained for use in the construction of railway material and in engineering, chiefly at Seraing, Liège, Charleroi, Brussels, Mons, Ghent, and Antwerp, while some shipbuilding is carried on at Hoboken. As in

the blast-furnace industry, the steel-works have completely recovered from the effects of the War, and development is continuing actively, the output of pig-iron and steel at the present time being nearly 37 per cent. above the output of 1913.



FIG. 43. THE LUXEMBURG IRON INDUSTRY

THE IRON INDUSTRY OF LUXEMBURG

The state of Luxemburg contains 260,000 people, of whom 50,000 live in the city and 110,000 in the iron district. The

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minette ore contains 40 per cent. of iron ; the mines and steel-works are at Esch, Dudelange, Differdange, and Rumelange, the latter being the most important. More than 6,500,000 tons of ore are produced annually, and more than 2,000,000 tons of steel. Before the War, when Luxemburg was within the German customs frontier, 1,800,000 tons of ore were imported from Lorraine, but at the present time the German market has been closed. It should be noted, however, that Luxemburg ores travel freely over the Belgian railways and waterways, so that there is an outlet for the iron and steel produced. Practically the same amount of pig-iron (2,500,000 tons) is produced as before the War, but the output of steel has been almost doubled.

METAL INDUSTRIES

The machinery, motors, locomotives, and wagons which are constructed in the Belgian factories are more than sufficient to supply home needs, and there is a considerable export of engineering products to Russia, China, Japan, the Belgian Congo, and other parts of the world. As in the British Isles, the more bulky products are manufactured either on the coalfields or where there is navigable water. Thus the heavy constructional materials are almost wholly produced in the Sambre-Meuse valley, while those industries which need relatively little raw material, but require either skilled workmanship or highly specialized processes for the production of relatively expensive articles, are found outside the coalfields. Thus the motor and cycle industries are widespread, though both Brussels and Liège are important centres. About four-fifths of the motor-cycles made are exported, and, despite the hindrances of high tariffs, 40 per cent. of the total output of the electrical industry is exported. Seventy per cent. of the cutting tools produced are also sent to foreign markets.

GLASS AND POTTERY

Glass sands occur round Charleroi and to the north-east of Moll, in the Campine. The workmen of Hainaut and

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Namur possess a high degree of technical efficiency, and though the origin of the fine glass industry may be traced to the local occurrence of glass sands and suitable fuel, at the present time the localization of the glass industry depends to an even greater degree on the technical equipment and scientific methods used. Plate glass was invented in France at Saint-Gobain in the seventeenth century, and was not made in Belgium until 1850, when an old convent at Ognies was converted into a glass-works. At the present time about a quarter of the glass made in Belgium consists of plate glass, for which Charleroi is specially important. Ninety per cent. of the output of plate glass is exported, chiefly to Britain, the United States, Latin America, Australia, and the Far East. The bottle industry of Liège is gradually being displaced by the manufacture of goblets and fine bottle-ware for export.

The pottery industry is also widespread, but the chief centre is Bouffoulx, which exports half its output. In a similar fashion the greater part of the porcelain made at Baudour and Brussels is also sent abroad. The export of bricks and tiles from the district lying round Boom and Duffel is important, large quantities being imported by Britain, but the output of Southern Flanders is consumed locally and in the Sambre-Meuse valley. Even chalk is exported, but the greater part of the 2,000,000 tons quarried is used for cement, especially at Tournai and Antoing.

CHEMICALS

Chemical industries are carried on at Liège and in the Campine, salt being obtained from the Nancy area. Two-thirds of the superphosphate produced is exported. In the case of the soda industries of Zeebrugge and Jemappes the salt is obtained from Normandy, but the chief centre of the ammonium sulphate, artificial graphite, benzol, phenol, and picric acid manufactures is the Mons basin. Wood waste is employed at Ghent and in the Ardennes, while the match industry is widespread, four-fifths of the output being exported, chiefly to Britain, Holland, and France. Pharma-

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ceutical products and explosives are made on a large scale, and a serious effort is being made to render Belgium independent of imported supplies of oils and fats, the local supplies of linseed and colza being supplemented by ground-nuts, sesame, and palm oil imported from the Congo. The principal oil-refineries lie along the Escaut near Antwerp, where cattle-cake and manures are manufactured (*cf.* Hull).

LEATHER

The leather industry may be found in pastoral districts, especially where local forests produce tanning materials, but it is now more usual at ports, where the raw materials are received and where there are important local markets, good distributing facilities, and relatively cheap labour. Flanders is essentially a cattle country. The Ardennes and the Campine possess woodlands, the Sambre-Meuse industrial resources, and Brussels artistic handicrafts. As a result the leather industries are widespread, though fine leather goods are chiefly made near the capital.

FOOD INDUSTRIES

There are thousands of breweries, hundreds of sugar-refineries, chicory-works, and distilleries engaged in the production of articles of food and drink both for home consumption and for export. Before the War Belgium produced a very large quantity of beet-sugar, and as the home consumption was seldom more than one-fifth of the output there was always a large surplus for export to Holland, Britain, the United States, India, and China. The greatest sugar-refinery is at Wanze, but the industry is widely distributed. Since the War Belgium has begun to export butter and margarine from Antwerp, the chief manufacturing centre. Paper and timber manufactures are found wherever the communications are good, both on the borders of the Ardennes forests and on the tidal estuaries, which offer facilities for import of timber from the Baltic Sea and from Norway.

BELGIUM: ECONOMIC DEVELOPMENT

TEXTILES

Apart from its metallurgical industries, it is probable that Belgium has made most progress in its textile manufactures, but, as the ancient textile centres were widespread, each has found it necessary to develop a high degree of specialization in order to prevent the absorption of small local industries in those of the larger towns. Linen is the most ancient textile manufacture in the valleys of the Lys and Escaut, and the Lys and Mandel rivers have been famous for centuries as centres of flax-retting. It was in the hand-loom industry that the Flemish weavers attained the skill which made the Escaut basin the principal textile centre of Europe throughout the Middle Ages. The actual soaking is still done near Courtrai, Roulers, and Tournai, and, in the north, at Ghent, Malines, and Lokeren. Of the thread mills nearly two-thirds are in Ghent. Sixty per cent. of the yarn is exported—*e.g.*, from Courtrai to Belfast. Some weaving is done at Courtrai, Alost, Iseghem, and Turnhout, but the principal centre is Ghent.

Woollen manufacture began during the Middle Ages, when fleece was obtained both from Upper Silesia and from Britain. As both these areas at present consume more wool than they can produce, the wool is now obtained from Australia, the Argentine, and South Africa, either through London or directly, through Antwerp. The fleece is washed in the waters of the Vesdre and La Hoegne, and a small proportion of the fleece is re-exported. Combing is carried out at Hoboken, while spinning is done both in the Verviers district and in Flanders. Two-thirds of the spinning-mills are in Verviers, which produces 85 per cent. of the woollen yarn. The other spinning centres are on the edge of the Campine—*e.g.*, at Louvain and Malines, and at Saint-Nicholas-Waes and Eecloo. Cloth is made at Saint-Nicholas, Eecloo, and Verviers, while flannels are made in the Campine, carpets at Brussels and Roulers, and hosiery at Tournai. The chief clothing centre is Brussels.

During the seventeenth century cotton manufactures consisted of a small hand-loom industry, and little progress was

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made until, in 1798, the burgomaster of Ghent introduced English machinery. As Ghent was the first place on the Continent to adopt power-looms, its progress was extraordinarily rapid, and by the end of the nineteenth century Ghent manufactured two-thirds of the cotton yarn produced in Belgium. The other spinning centres are in Flanders, Hainaut, and

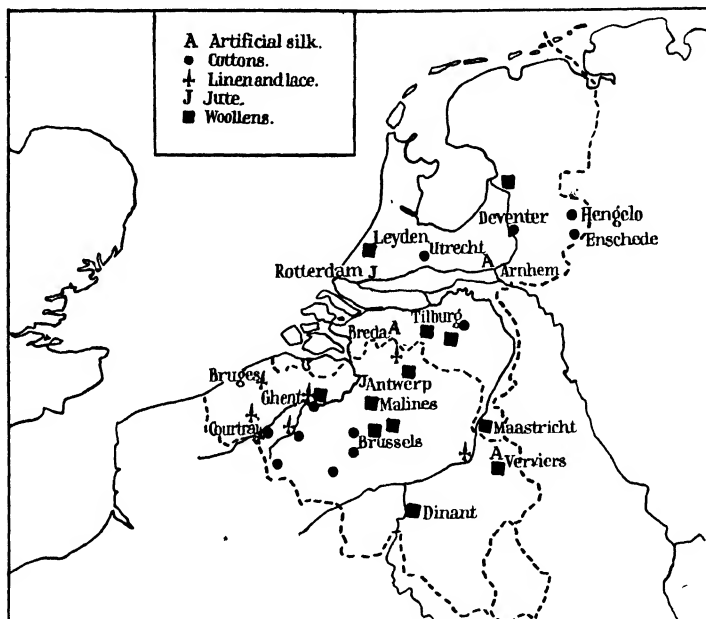


FIG. 44. DISTRIBUTION OF THE TEXTILE INDUSTRIES OF HOLLAND AND BELGIUM

Note how the textile industries are found chiefly on the poor sandy soils of the Campine and Geest, and not on the coalfields, as in Britain.

Brabant. The United States still supplies more than half of the raw cotton used, but since the War much larger shipments have been received from India and Egypt. The chief centres for thread are Alost, Ninove, Comines, and Iseghem, but these towns are completely overshadowed as weaving centres by Ghent and, to a smaller extent, by Saint-Nicholas, Braine-l'Alleud, and Termonde. Nearly half the cloth produced is exported.

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Jute, hemp, and horsehair industries are also important, but the lace industry is declining. During the latter part of the nineteenth century lace was still an important hand industry, but after the introduction of power machinery at Nottingham, followed by changes of fashion, the industry has declined and offers employment to less than a third of the former number of workpeople. The silk industry is unimportant, except in connexion with the manufacture of silk goods using either artificial or imported silk. Tubize, Obourg, Couture, and Saint-Germain make artificial silk. Ribbons are manufactured at Brussels and Vilvorde and embroidery at Brussels and Lierre. The chief markets for Belgian textiles are France, Germany, Switzerland, and Holland.

SUMMARY OF THE INDUSTRY AND TRADE OF BELGIUM

Being highly industrialized, Belgian agriculture is not entirely self-supporting, considerable quantities of grain and other foodstuffs having to be imported in exchange for manufactures. More than twice as valuable as the food imports are the raw materials needed to feed the great industries. In fact, the requirements of the textile industries are comparable in value with those of the cereals imported. The smallest item in the import trade consists of manufactured articles of which the most important are chemicals, metals, machinery, and textiles. The exports consist principally of manufactured goods, metals, metal goods, machinery, yarn, cordage, cloth, and glass, but both textile raw material and coal are exported, together with a considerable amount of foodstuffs, chiefly grain. These raw materials and foodstuffs find a market in the North French coalfield and in Holland. In 1924 the value of the export trade was about 80 per cent. of that of the imports, an indication that Belgium is beginning to derive an income from foreign investments and from reparations payments.

Though Belgium is one of the most densely populated areas in Europe (*cf.* Holland and Saxony), there are considerable

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differences in density of population. Naturally the coalfields and the urbanized districts of the large towns are most densely peopled. In the central plain the density of population varies from about 700 persons per square mile in South-west Flanders and the 'limoneuse' region to about 250 per square mile in the Campine. The region of improved sandy soils in Waes, near Ghent, is intermediate in density, 500 persons per square mile. In the more infertile regions of the southern uplands the population decreases from 500 persons per square mile in the fruit district of the Hervé plateau to about 350 per square mile in the Condroz and Famenne areas, while in the Ardennes proper the population is quite scanty—*i.e.*, 120 per square mile.

Belgium is peculiarly a country composed of industrial villages using power machinery and deriving its raw material both from local sources and from abroad. In many of these villages there are two or three different kinds of industry, employing different sections of the population. Moreover, the migration of labour is easy, and, as a result, though so highly industrialized, Belgium does not suffer from the industrial depressions which endanger the social conditions of districts like the cotton-manufacturing centres of Lancashire and the blast-furnace districts of the mouths of the Tees and Clyde.

It is to its unrivalled system of inland communication more than to any other single factor that Belgium owes its industrial prosperity. There are more than 580 miles of railway or inland waterway for every thousand square miles of area, and nearly nine miles per 10,000 inhabitants. The figures for Holland are similar to those for Belgium, except that railways are somewhat less and waterways rather more important. Most of the Belgian canals are owned by the State, and the tolls are, in consequence, very low. The railways are also excellent and State-owned, but the Governments have never allowed the interests of the railways to interfere with the industrial and commercial needs of the respective countries. It is because of this that Antwerp is the chief distributing centre for a large part of the canal system of North-west Europe, and from the mouth of the

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Escaut grain, minerals, cotton, wool, timber, coal, and machinery are carried by barges in all directions. In return rail-borne parcels of manufactures are gathered for export overseas. Rotterdam also imports cargoes of raw materials and foodstuffs, but its railway system is inferior to that of Antwerp, so that it has to be content with the Rhine transit trade in bulk cargoes. Amsterdam has excellent distributing facilities for Holland, but its hinterland is less extensive than that of Antwerp.

CHAPTER XIV

THE LOW COUNTRIES: HOLLAND

DURING the Tertiary epoch sea covered the greater part of what is now Holland, but toward its close the southern parts of the North Sea plain rose above sea-level and the Rhine claimed as its tributaries practically all the eastern rivers of England. The Ice Age further modified the relief of the Netherlands, and the return of the sea which followed separated Britain from the Continent and left the greater part of Holland as a vast delta. Slowly the rich muds brought down by the rivers have been reclaimed and brought under cultivation. The rivers flow along channels raised above the level of the fields: a stoppage in the flow might at any time cause the loss of what has taken centuries to reclaim. At the same time, the tides along the Dutch shores entail the construction of exceedingly strong sea-embankments, whose safety depends on their being at a higher level than the North Sea when spring tides often coincide with the strong onshore winds of deep winter cyclones. One such storm produced the Zuider Zee, which, with the delta of the Rhine-Maas, divides Holland into two parts. In few districts is the elevation more than 200 feet, and practically the whole of Western Holland lies below the level of high tides. In the south-east parts of the Tertiary plain of Western Europe remain, and in the extreme south there is a small district which is of the same age as the Ardennes.

In spite of Holland being one of the smallest states, its position at the focus of the principal routes of Western Europe gives it an importance out of all proportion to its area. Moreover, the Netherlands possess a very large colonial empire, with a total population of about fifty millions. In Asia alone the area of Dutch territory is equal to that of France, Germany, the United Kingdom, and Denmark com-

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bined, while there are other Dutch possessions in America and Australasia.

The climate of the whole country is influenced by the nearness of the sea, but there are, nevertheless, considerable local variations, the average temperature for January ranging from 34° F. at Gröningen to 37° F. at Flushing, and the midsummer temperature from 64° F. at Maastricht to 53° F. at the Helder. Though these climatic differences may seem slight, they have importance in agriculture. The chief industrial crops are grown in the south-west, while such crops as potatoes and rye are more important in the north and east.

PHYSICAL REGIONS

1. **Northern and Western Holland.** The north and west of Holland consist of alluvial deposits and continue the belts of dunes and polders already noted in Belgium. The greater part of Western Holland lies slightly below sea-level, and the task of maintaining what has already been recovered from the sea requires not only the most constant vigilance, but also the continuous expenditure of large sums of money.

2. **Eastern and Southern Holland.** Except in the extreme south, where the hilly country of the Hervé and Aachen districts is continued in South Limburg, which rises to nearly 1000 feet above sea-level, the surface of Eastern Holland is low and railways are able to cross the watersheds without tunnelling. A great part of the east is covered by Quaternary soils, chiefly glacial clays and gravels, which form low plateaux between the broad zones of alluvium of the Rhine and Yssel valleys.

(a) The Geest of South Peel and Brabant is a continuation of the Campine as far as the Rhine alluvium which forms a belt between the line Xanten-Cleves-Nimegen-s'Hertogenbosch-Antwerp, and the line joining Utrecht, Arnhem, Zutphen, and Wesel on the north and north-east.

(b) The Geest of Gelderland, Overysse, and Friesland forms a low-lying plateau of glacial gravel, capped to the north of Zwolle by peat deposits and low-lying marshlands, which are difficult to bring under cultivation. The marshes

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and low moors of Friesland are the scene of a continuous struggle to develop untractable country. Since 1833 the proportion of waste land has been reduced from 28 per cent. to less than 13 per cent., and in no part of the country has

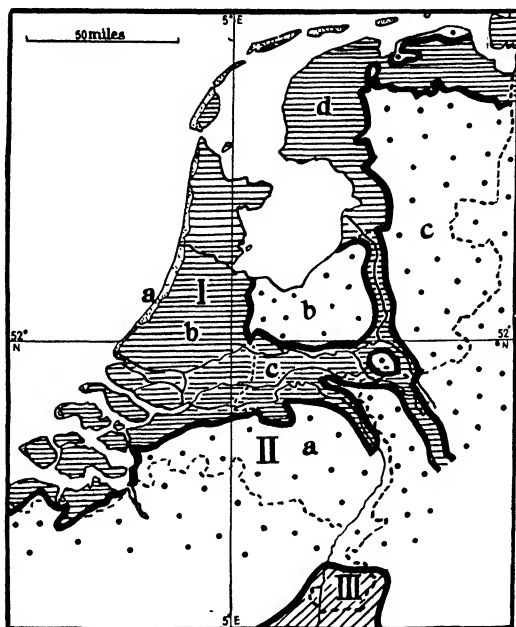


FIG. 45. PHYSICAL REGIONS OF HOLLAND

- I. Western and Northern Holland (alluvial soils): *a*, dunes; *b*, polders; *c*, river alluvium; *d*, fenlands.
- II. Eastern and Southern Holland (glacial soils): *a*, Kempenland; *b*, Gelderland and the Veluwe; *c*, Overijssel Geest.
- III. South Limburg hill country.

the work of reclamation called forth such efforts as in the region which lies between the Zuider Zee and the Ems river.

LAND RECLAMATION

A very large proportion of Holland lies within the deltas of the Rhine, Maas, and Scheldt, and it is only by the exercise of the greatest skill that the Dutch engineers are able

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to maintain their coastal defences, especially when the passage of a deep cyclone coincides with full or new moon and

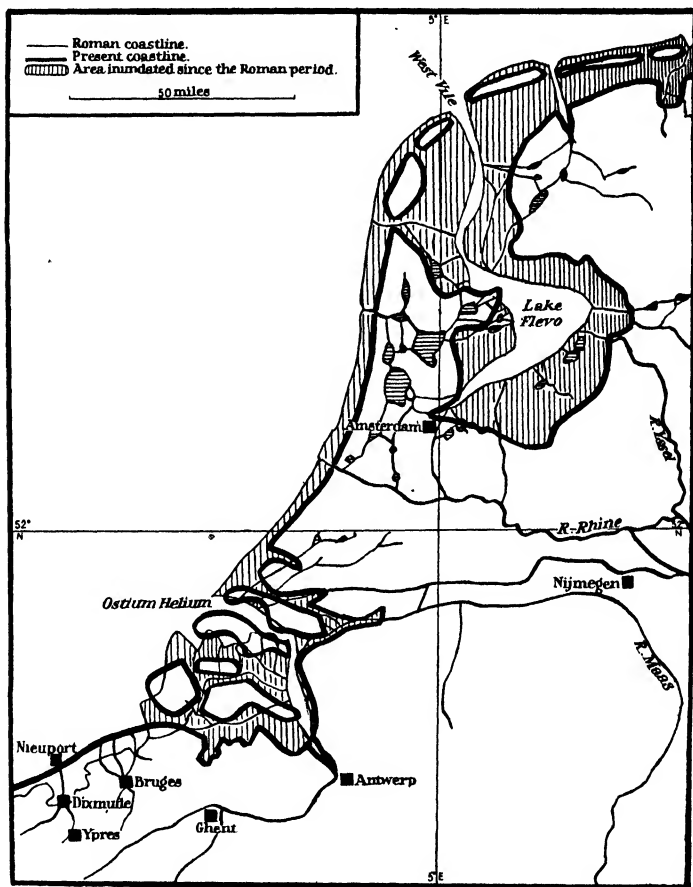


FIG. 46. THE NETHERLANDS COAST IN ROMAN TIMES

Note the former positions of Bruges, Dixmude, and Ypres as medieval ports.

north-west winds raise the level of the high spring tides. The chief danger of flooding, however, comes from the inland waters, and any circumstances which tend to block the outlets of the distributaries of the Rhine may cause serious

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floods. If, as has occasionally happened, the Dutch rivers are blocked by ice when the snow and ice of the upper streams begin to melt, the river and canal banks may be broken and widespread destruction caused. It must be remembered that the Rhine and its distributaries are continually raising their beds by the deposition of river silt, so that in several places such as the Gorkum district large areas are actually below the level of the *beds* of the rivers. In the east, and particularly in Friesland, the high fens have supplied peat for centuries, and the places from which the peat has been removed become deep lakes separated by areas of unsteady ground, which often collapses after heavy rains. On the west of the Zuider Zee the Haarlem lake was also considerably enlarged by the recession of its shores, especially on the north-east, where the waves driven by the prevailing winds ate into the soft peaty shores.

It is probable that land water weakened the defences of Lake Flevo, which in Roman times occupied the centre of what is now the Zuider Zee, and a period of unusually high tides during the thirteenth and fourteenth centuries allowed the sea to breach the line of dunes, with the result that Vlieland and Terschelling were converted into islands and the sea-waters spread eastward into the gulf of Dollart near Gröningen (1277) and southward into Lake Flevo, which was converted into the Zuider Zee. In the thirteenth century the area of the Haarlem lake was estimated at 22,000 acres, but as the barriers between the small lakes disappeared the water surface was greatly increased, and covered about 42,000 acres in 1848, when systematic draining began. As in most of the cases, the draining was undertaken to prevent further loss of land.

The inundations attained their greatest intensity in the fifteenth century, and in 1421 the Maas and Waal changed their courses, and, bursting the dikes near Stryen and Werkendam, drowned thousands of people and completely destroyed at least thirty-five villages. The flooding of the town of Dordrecht was only just averted. The original of the first map in Fig. 47 is dated 1357, and shows the position of the *Mosa Antiqua* as an inland river and Dordrecht

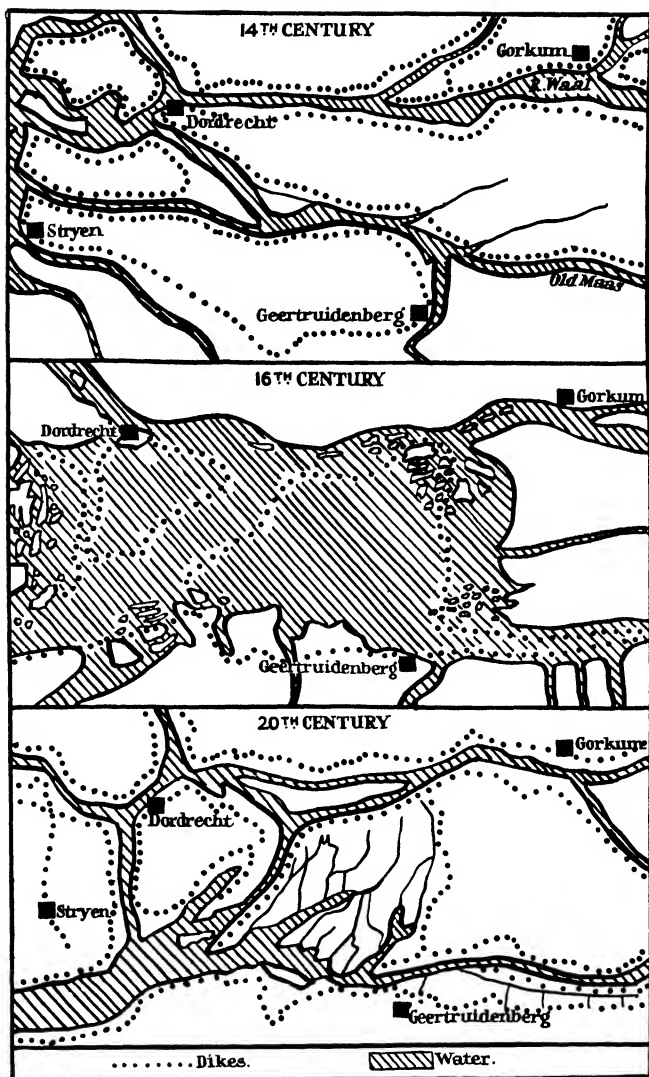


FIG. 47. MAPS OF THE BIESBOSCH DISTRICT

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(Thuredrecht) as the chief inland village in a large island lying between the Maas and the Waal. The second map shows the outline of the rivers in the sixteenth century, when the greater part of the district to the east of Dordrecht was under water. At the present time a great part of the inundated area has been reclaimed. The Waal and the Maas having become tidal rivers, Dordrecht became a port for East India merchantmen, and is still accessible from the sea. After the great floods had opened the present mouths of the Maas and the Waal Dordrecht became the centre where the rafts of timber floated down from the upper Rhine were broken up for the construction of houses and ships.

In consequence of the construction of ship canals from the North Sea to Amsterdam and Rotterdam the Zuider Zee is no longer needed for purposes of navigation, and at the present time a serious attempt is being made to reclaim a large part of its area. Already the island of Wieringen has been linked by means of a breakwater to North Holland, and the work is being continued toward the Friesland coast. When the work is completed the southern part of the Zuider Zee will be converted into an inland lake (Lake Yssel), which will then be pumped dry, navigable channels being left.

The advantages of the great dam are that (i) without it all the dikes behind would have to be made strong enough to withstand sea-storms, (ii) the Yssel lake will contain fresh water, which may be used to irrigate the cattle pastures of the newly made polders, (iii) in wet weather the natural drainage of the country surrounding the present Zuider Zee will be assured because of the practically constant level of the lake, and (iv) the dam will supply a foundation for railway communications between North Holland and Friesland. It is estimated that the area reclaimed will accommodate about 300,000 people and will greatly increase the capacity of the Dutch pastoral industry. On the other hand, a certain coast population will be deprived of their occupation of fishing. Thus Holland hopes to add nearly 900 square miles to her territory by a successful combat with nature. This

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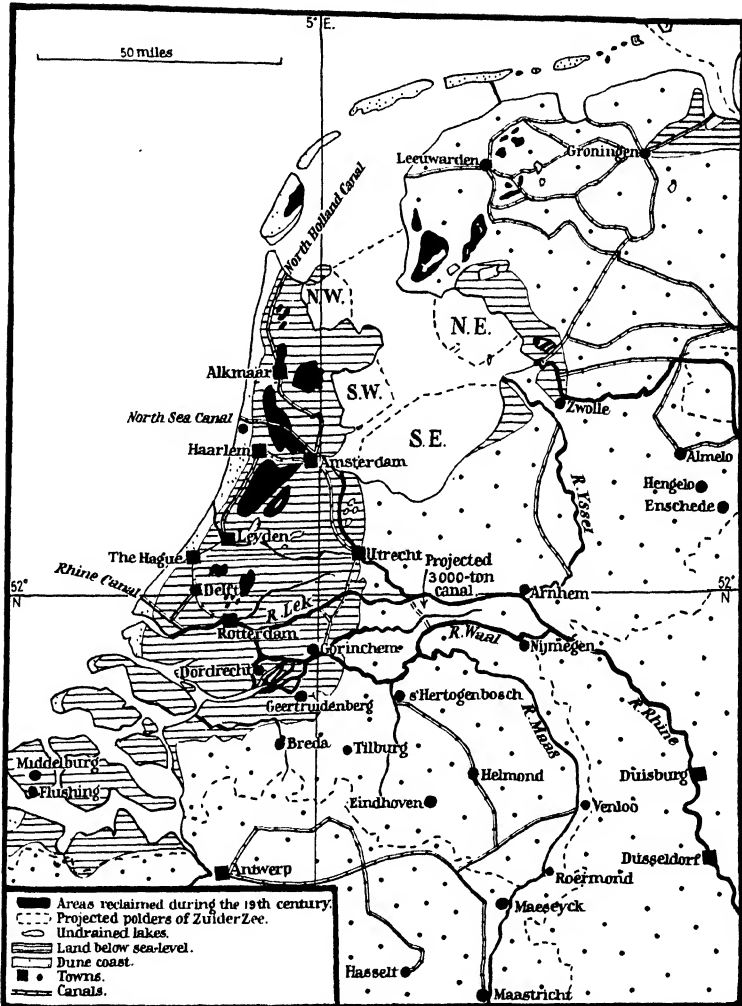


FIG. 48. LAND RECLAMATION IN HOLLAND

is but another instance of the enterprise of the Dutch in reacting against an environment that repels intensive settlement.

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AGRICULTURAL DEVELOPMENT

In the first half of the nineteenth century a quarter of the total agricultural output of Holland was exported, but at the present time only one-tenth of the farm produce is marketed abroad. In spite of the great increase in home consumption, the value of agricultural exports has increased tenfold since 1850. Partly for economic reasons, and partly because it is impossible totally to exclude water from the polders during winter, Holland is mainly a pastoral country, about 38 per cent. of the area consisting of permanent pasture. In general the north-east and south-west of Holland are arable, the west is pastoral, and the east is either woodland or heath pasture. As it consists of heath-covered glacial soils, the eastern half of the country is chiefly important for cattle-raising, while the alluvial polders, in addition, produce sugar-beet, wheat, and fruit. Where there is an abundance of water and easily worked soil the land is used for the intensive production of garden produce, and gardens and orchards occupy 3 per cent. of the total area. The amount of arable land has increased by one-fifth during the past fifty years, and about 27 per cent. of the total area is now under cultivation. Nevertheless, nearly one-quarter of the country is covered by moorland and water, though the area of waste land has been reduced to half of what it was in 1800. Seven per cent. of the country is forested.

As the dominant feature of Dutch agriculture is its specialization in pastoral industries, more than half a million people are engaged in the cattle industry. A large proportion of the arable land is consequently under fodder crops, and dairy cattle are now more important than meat animals. Condensed milk, cheese, and butter are manufactured for export to Britain, Belgium, and France. During the War Germany was the chief market for Dutch dairy produce, but recently a high import duty has been imposed on Dutch butter and cheese in order to stimulate dairy production in Germany. There is also a small export of fresh meat and live cattle, frozen and chilled beef being imported from South America and Australia for home consumption.

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Some wheat is grown, but the crop is not sufficient for home needs, and large quantities are imported. Forty per cent. of the arable area is under rye, potatoes, and oats, but in the south-west the finer soils are often under sugar-beet, and more than 250,000 tons of sugar are obtained from Holland's domestic crop. The other industrial crops are chiefly grown in the south-west, where intensive cultivation is more important than elsewhere. Tobacco and flax are



FIG. 49. THE DUNES, DOMBURG, HOLLAND

The dunes which protect the polders of Holland and Belgium possess numerous summer bathing resorts.

By courtesy of the Netherlands Office for Tourisme

important in several districts, Haarlem being the centre of bulb cultivation, while market-gardens extend from the neighbourhood of the Hague and Rotterdam to Enkhuizen, in North Holland. Fruit is chiefly grown in the country lying between the Rhine and the Maas from Nimegen to Gorkum, in the south of Limburg, and in the islands of Zeeland. There are nurseries of young trees and ornamental shrubs in the neighbourhood of Breda, Leyden, and Amsterdam. As elsewhere in Continental Europe, sheep are generally found on land which cannot be cultivated. They are chiefly in the poor country of the moors of Gelderland,

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Overijssel, and the north, especially in some of the islands—*e.g.*, Texel. It is important, however, to note that the number of sheep decreased by 25 per cent. between 1910 and 1921.

The great density of population, the nodality of the chief ports, and the possession of overseas colonies have led to the development of such industries as sugar-refining, tobacco, cocoa, quinine, mineral and vegetable oil refining, soap, margarine, cattle-cake, and fertilizer manufactures. Those which owe their origin to local agricultural conditions are the manufactures connected with dairy produce, starch and strawboard from potatoes, and the textile industries.

SUB-REGIONS

1. Northern and Western Holland

(a) Though the dunes are barren their landward edges are generally under more intensive cultivation than those of Belgium. In the "Westland" district, between Rotterdam, the Hague, and the Hook, the sands of the dunes have been mixed with clay, and the resulting loam, fertilized with fish manures and potassium salts, is largely under glass.

(b) The polders and the low-lying areas of the Rhine, Maas, and Yssel valleys include purely agricultural districts like West Holland and Zeeland and permanent grasslands such as those of North Holland, the Rhine valley, and the peat-free districts of Friesland. In the former the earliest Dutch manufactures began, linens and woollens having been made from a very early date at Leyden (70,000 inhabitants) and Haarlem (115,000 inhabitants), while cotton-manufacturing was introduced toward the end of the seventeenth century. Delft (49,000 inhabitants) has long been noted for its fine porcelain, and has recently begun to make motor-cars. The capital, The Hague (425,000 inhabitants), possesses luxury industries such as the making of gold and silver ware. (For Amsterdam and Rotterdam see pages 253-257.)

The country between the Waal, Rhine, and Maas produces fruit and tobacco, but the low-lying polders are almost

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entirely pastoral. Alkmaar (28,000 inhabitants) is the market centre for the cheese of North Holland. Middelburg (19,000 inhabitants) is the butter market of Zeeland. Its weekly market is bright with the display of native dress. Throughout Western Holland the density of population is remarkably high, and averages 1200 persons per square mile in the north and 1400 in the south. This is due chiefly to



FIG. 50. WESTLAND—THE LAND OF MARKET-GARDENS

The whole of the country between The Hague and the Hook of Holland is below the level of high tides. The photograph shows the coast, but the dunes are so low as to be almost indistinguishable. The large acreage under glass should be noted.

By courtesy of the Netherlands Office for Tourisme

Photo by K.L.M. (Royal Dutch Air Company)

the existence of tidal water almost everywhere, and especially to the growth of world-ports at Amsterdam and Rotterdam. The other important towns lie at the junction of navigable waterways.

(c) The alluvial country lying above flood-level in the Rhine, Waal, and Mass valleys has fields of rye and a great deal of orchard and woodland, with markets at Arnhem (77,000 inhabitants), at the bifurcation of the Rhine and Yssel, at Utrecht (151,000 inhabitants), the great centre of

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inland waterways, and at Nimegen (78,000 inhabitants), a former Imperial city which commands the traffic along the Rhine to Germany.

2. Eastern and Southern Holland

The sandy heaths of Peel, Limburg, Overijssel, and Gelderland are a continuation of the moors and woodlands of the Campine. They are scantily populated districts of poor pasture, with tanning, linen, woollen, cotton, and margarine manufactures.

(a) The Peel plateau is not densely populated, but the crops grown are not sufficient to feed the local population, and manufactures have therefore developed. Pears and plums are grown for export and for the manufacture of jam. Leather is manufactured at Waalwyck and Kaatsheuvel and marketed at Nimegen. In Brabant the principal industry is the production of butter and margarine for export, the chief markets being s'Hertogenbosch (Bois-le-Duc), Eindhoven, Oosterhout, and Oss. The people of North Brabant are of Frankish origin and markedly efficient in industry. The poverty of the soil made the development of industries possible, and though many people emigrated others remained to carry on hand-loom woollen and wooden shoe industries. Cotton-spinning was introduced during the eighteenth century, but after the secession of Belgium the hand-loom industries declined. In the latter part of the eighteenth century Tilburg (76,000 inhabitants) was a grazing centre, with a local cattle market. In 1795 Holland became part of the French Republic, and for a time the greatly extended market led to the freer growth of the flannel and jute industries. From 1840 to 1862 the hand-loom industries languished, but during the latter half of the nineteenth century the Dutch mills were modernized, and at the present day there are practically no outworkers left in the textile industries. Tilburg is the centre of a large number of woollen mills, and has developed boot, metal, furniture, and cardboard manufactures. Eindhoven (79,000 inhabitants) became the chief market of Kempenland in the seventeenth and eighteenth

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centuries. The growth of its hat, woollen, and cotton industries has followed lines similar to those noted in the case of Tilburg. During the present century it has become the greatest centre of the manufacture of filament lamps. Maastricht (59,000 inhabitants) belongs geographically to the Belgian Campine; it developed fine glass industries before the secession of 1830. Coal and glass sands are found in the neighbourhood, and the nearness of the Moresnet, Liège, and Verviers districts has given rise to local paper, woollen, and zinc works.

(b) The Geest of Gelderland and the Veluwe ('badlands') is also a poor, sparsely peopled area with crops of rye, potatoes, and buckwheat, paper being manufactured from straw at Apeldoorn (59,000 inhabitants), woollens at Veenendaal, and tobacco at Amerongen. Utrecht, where routes between Gelderland and the polders of West Holland cross the north-south line of communication is the great centre of inland waterways and railways. Its control of routes has given rise to rolling-stock, machinery, chemical, lead, zinc-plate, and tobacco industries. Its importance will probably increase with the opening of the deep-water canal to the Waal.

(c) The Geest of Eastern Holland consists of forest and heathland on the glacial gravel soils and water meadows of the Yssel valley. The density of population averages about 200 persons per square mile, but this is chiefly on account of modern industrial developments. Buckwheat, rye, potatoes, and fodder plants are again the chief crops, with corn markets at Zutphen and Deventer (35,000 inhabitants). Twente is an area of poor soils. Its development was formerly retarded by lack of communications. There were no railways when modern industries began to develop, and it was not until the latter half of the nineteenth century that the local cotton hand-loom industry was reorganized on modern lines. Belgium's withdrawal gave a local market for the cotton goods of Eastern Holland, and the development of the Dutch East Indies and the opening up of the Rhenish-Westphalian coalfield stimulated the growth of the cotton-mills of Enschede (52,000 inhabitants), Hengelo (34,000 inhabitants), Almelo, Oldenzaal, and Winterswijk. Salt is mined in Overijssel.

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DUTCH COALFIELDS

With the exception of grain, coal and coke are the two most important items of Dutch overseas trade as regards both bulk and value. As a result of (i) its central position with respect to the European coalfields, and (ii) its excellent cheap water-transport, Holland obtains its coal more cheaply than any other country in Europe. British sea-borne and Westphalian river-borne coal compete for the Dutch market by lowering prices, with the result that Rotterdam has become one of the world's greatest coal-ports. The coal deficiency of Holland is normally about six million tons, of which four million are usually obtained from Britain. Holland's home production, however, is not negligible, and in 1930 the Dutch coalfields produced 12,600,000 tons. In fact, Holland possesses very considerable reserves—South Limburg 1,400,000,000 tons, Central Limburg and South Peel 1,700,000,000 tons, and Gelderland 300,000,000 tons. In pre-War days the development of Holland's coalfields was hindered by the cheapness of British and German coal, but during the War the price of coal rose to a sufficient extent to justify the development of the Dutch coalfields.

(a) The South Limburg coalfield is a continuation of the Aachen coalfield, and is probably continuous on the west with that of the Campine. The chief mines lie between Heerlen (45,000 inhabitants) and the German frontier town of Herzogenrath, and development is rapidly taking place in the district which includes Kerkrade (36,000 inhabitants), Schinnen, Geleen, and Sittard. Before the War the total output of coal was less than two million tons, but this quantity rose rapidly during the War, the State-owned mines alone producing 3,300,000 tons in 1919. When the German and English markets were decontrolled the output of the State mines fell off, and is now about 2,000,000 to 2,500,000 tons, roughly one-third of the total output. The closing of the Ruhr mines in 1923-24 stimulated the Dutch coal industry, and the output by now exceeds 10,000,000 tons a year. Despite State assistance in marketing and development, there are several difficulties which have hitherto

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hindered rapid developments. (i) The natural markets for South Limburg coal are the districts of Aachen and Liège,

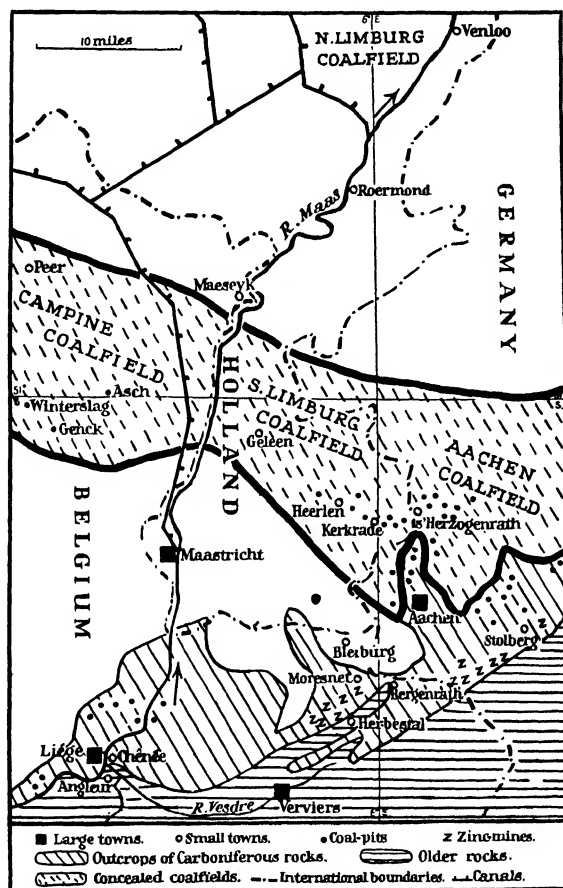


FIG. 51. THE DUTCH COALFIELDS

but for a time Dutch coal was excluded from these regions by the necessity for import permits in the case of Germany and by the desire of the Belgians to foster the mines of the Campine. (ii) The Dutch canals are not sufficiently developed

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to carry the output of the mines from the pit-head to the Rhine mouth, and, though the coal possesses a high calorific value, the coke yielding good foundry and blast-furnace material suitable for the Lorraine, Luxemburg, and Belgian furnaces, the seams are faulted, and in many cases rather too thin for profitable working. Moreover, the Maas is not easily navigable. (iii) The South Limburg coalfield is a considerable distance from the Dutch coal-consuming areas, where the dumping policy of German and British coal-exporters makes competition difficult. The German coal area lies in the Ruhr, whose railway, canal, and river communications are much more highly organized than those of Limburg. Western Germany should be Holland's best customer, and Dutch coal is beginning to enter Germany as well as France, Belgium, and Luxemburg, which together received 2,000,000 tons of Dutch coal in 1926. It should be noted, moreover, that the Dutch are developing a navigation channel in the Maas in order to provide cheap transport to the more northerly parts of Holland.

(b) The North Limburg and South Peel coalfield, in the neighbourhood of Venloo, is not yet developed, though a shaft has been sunk at Vlodrop.

(c) The Winterswijk continuation of the Westphalian coalfield has coal measures at a workable depth (4000 feet) in a district which has already been influenced by the nearness of the Ruhr coalfield, textile and metallurgical industries offering a market for the output of the pits which are being sunk at Winterswijk, Buurse, and Bochotz.

INDUSTRIAL DEVELOPMENT

Nearly 40 per cent. of the working population of Holland are engaged in mining and manufacture, and 20 per cent. in commerce and transport, while less than 1 per cent. are normally unemployed. It has already been noted that coal is generally cheaper in the ports of Holland than elsewhere in Europe, and it has been possible for Holland to develop manufactures wherever there are suitable local conditions. The poverty of the soils and the overpopulation of the towns

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lead to the existence of a relatively low standard of living in the poorer districts, while the ease with which raw materials can be obtained has facilitated the development of new manufactures.

Holland possesses the chief requisites for the development of manufactures—cheap labour, abundant raw materials, cheap coal, and excellent communications by water, rail, and motor transport. It is not surprising, therefore, that Holland ranks as an important manufacturing country. The iron and steel industry is based entirely on imported raw materials, the chief blast-furnaces being at Velsen, at the entrance of the North Sea Canal, and at Hengelo, near the Westphalian frontier. The steel-works are at Zuilen and Ridderkerk. Railway material and ships are made in Holland; the ports of Dordrecht and Rotterdam also repair ships. The electrical industry has likewise made great progress, especially in the filament-lamp industry of Eindhoven. For several centuries cables have been made at Amsterdam, but hemp has been replaced to a great extent by steel.

In the days of the first Dutch Republic the industries, such as sugar-refining and salt, tobacco, and cloth manufactures, were almost entirely confined to the towns. They were never very prosperous, because all the energy of the Government was concentrated on the development of Dutch trade and shipping, at that period the greatest in the world. The manufactures that were carried on—*e.g.*, the bleaching of Silesian linen ('holland') for export—were confined to the western cities and to the Southern Netherlands (Belgium). After the fall of Napoleon the free-trade policy was altered and in the Dutch Indies high duties were imposed on goods of other than Netherland origin. Up to 1830 these goods came mostly from the south, and, to a smaller extent, from Overijssel, where a few small mills of the Lancashire type had been started because of the abundance of cheap labour.

In 1830 Belgium seceded, and as the Dutch East Indies remained with Holland the whole of the textile requirements of Holland and its colonies had to be supplied by the Dutch mills.¹ English experts were brought to Twente to develop

¹ Water-power was developed in small mills in Dutch Brabant, Gelderland, and Overijssel during the eighteenth century.

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the cotton industry, and the Netherlands Trading Society, which monopolized colonial trade, confined its purchases to the mills of Twente. The industry grew rapidly, and is now responsible for three-quarters of Holland's cotton production. Since the War Japanese competition in Asia has compelled the Dutch exporters to seek new markets in South America and China, as it is no longer possible to monopolize the East Indian market. The older textile centres are Leyden and Tilburg (woollens), Helmond and Eindhoven (cottons), Boxtel (linen), and Breda (artificial silk).

The fishing industry employs 20,000 men, and is now carried on from Vlaardingen, Maasluis, Scheveningen, Katwyck, and Imuiden. The fishing villages of the Zuider Zee are unimportant, and will be extinguished by the reclamation of that area. The yearly catch amounts to about 600,000 tons (16 per cent. herrings). Half the fish taken is consumed in Holland, the bulk of the rest being exported to Germany and Belgium. There are a number of minor industries connected with the preparation of foodstuffs, leather, rubber, paper, glass, pottery, and tobacco. It is noteworthy that more persons are engaged in banking than in fishing, and Holland is more dependent on international trade than any other Continental nation, with the possible exception of Switzerland. The Dutch interest in whaling, which was great in the Middle Ages, has now entirely ceased.

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TRADE

The chief imports of Holland are coal from Britain, Germany, and Belgium, raw steel and machinery from Germany and Belgium, timber from Finland, Sweden, Russia, and Czecho-Slovakia, cotton thread from Britain and Belgium, wheat from North America, the Argentine, and India, maize from the Argentine, the United States, Rumania, and the East Indies, oil-seeds from India, China, the Argentine, and Belgium, nitrates from Chile, Germany, and Norway, copra from the East Indies, Malay, and the Philippines, cotton from the United States, India, and Bremen,¹ rice from Ham-

¹ Re-exports from European *entrepôts*.

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burg¹ and London,¹ coffee from Brazil and the East Indies, tobacco from the East Indies, leather from Germany, and wool from London¹ and Antwerp.¹ A very large proportion of Holland's imports consists of foodstuffs and raw materials, more than half of the total being obtained from Germany, Britain, and Belgium. Nevertheless, the Dutch ports have direct shipping services which bring goods direct from almost every country in the world. With the possible exception of Norway, Holland possesses the greatest tonnage of shipping per head of population.

Holland's exports are chiefly sent to Britain (27 per cent.), Germany (14 per cent.), Belgium (11 per cent.), France (10 per cent.), the East Indies (8 per cent.), and the United States (5 per cent.), but smaller quantities are sent to the Argentine and the countries of Central and Northern Europe. The excess of imports from over exports to the United States is due to the great extent to which Dutch capital has been invested in American undertakings. In 1926 the value of Dutch imports exceeded that of the exports by nearly £60,000,000, the balance being made up by shipping and *entrepôt* services and the returns of Dutch capital invested abroad.

The principal exports are raw and manufactured foodstuffs. More than a quarter of the exports consists of meat and milk products. Nearly a quarter is made up of metal and textile manufactures, while other important exports include sugar, bulbs, and coal-tar and pharmaceutical products, the latter in transit from Germany. The total international trade of Holland in 1925 amounted to 76,500,000 tons, half of which was carried by sea and nearly half by river. More than four-fifths of the foreign trade is carried on by the ports of the New Maas, and especially by Rotterdam. The smaller ports of Dordrecht, the Hook, Maasluis, and Delftzyl possess local traffic, while Vlaardingen has a considerable transit trade in iron ore. The Scheldt possesses the packet station of Flushing and the outport of Ghent (Terneuzen).

Outside the New Maas the only important Dutch port is Amsterdam (749,000 inhabitants). This was originally a

¹ Re-exports from European *entrepôts*.

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small fishing village in the marshes on the south-west of the Zuider Zee. In 1275 the fishermen-traders made a dam across the river Amstel in order to separate it from the bay, Het Y, and thus prevent floods. In consequence of this the Count of Holland exempted its inhabitants from taxation. This privilege attracted trade with Hamburg and the Baltic ports, and when the herrings changed their spawning grounds, during the fifteenth century, from the Baltic to the Dutch coasts Amsterdam was one of the first places to benefit.

The great value of Amsterdam's position was its defensibility. This was proved when the Spaniards sacked Antwerp, and during the sixteenth and seventeenth centuries Protestant and Jewish merchants flocked into the town and Amsterdam became the first port of Europe. To a considerable extent this was due to the fact that the Dutch had acted as carriers for the Portuguese East Indies, and after Portugal had been absorbed by Spain the Dutch attacked and captured the East Indies, and have retained them ever since, except during the period when Holland was held by France. During the whole of the seventeenth century the Dutch monopolized the trade of Indonesia, and Amsterdam accumulated sufficient capital to become one of the world's principal financial centres.

With the rise of British power in the eighteenth and nineteenth centuries Amsterdam lost its monopoly of Eastern trade, and the increased size of ocean-going vessels made the old route through the Zuider Zee impracticable. Canals were therefore made to give easier access to the North Sea. The Helder Canal was constructed in 1835, but the continuous increase in the size of seagoing ships soon caused it to become obsolete. The North Sea Canal was made later, and enables large vessels to reach the docks, so that Amsterdam still retains a large overseas trade. It is no longer one of the greatest *entrepôt* ports because it is at the wrong side of the mouths of the Rhine and has always been difficult to keep clear. Early in the nineteenth century its canals were kept open only by windmills, which forced the water along the channels and so prevented the accumulation of mud brought down by the Y. The place where the original dam was built

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is now a large square in the centre of the city, and large sums are expended annually in keeping the port clear.

Some of the great accumulation of capital already referred to has been used in developing specialized industries. This is particularly noteworthy in the manufacture of imported colonial produce. Amsterdam is the greatest cinchona, diamond, and tobacco market in the world, while it also controls a large proportion of the European trade in rubber, cocoa, tea, sugar, timber, copra, spices, dried fruits, rice, and rattan. These commodities have led to the manufacture of quinine, margarine, chocolate, and cattle-cake. The products of intensive cultivation in Holland have made Amsterdam important for the export of butter, cheese, paper, and strawboard, and it remains the warehousing port for Holland and for parts of Germany. By means of the Merwede Canal¹ it still possesses access to the Rhine valley, to which it sends a million tons of cargo, chiefly grain and timber, each year, receiving in exchange about half a million tons of coal from the Ruhr. It should be noted that Amsterdam is much less important in this connexion than either Rotterdam or Antwerp.

During the War Holland's neutrality made Amsterdam the banking centre for the securities of Central Europe, and the guilder depreciated less than any other European currency with the exception of that of Sweden. Moreover, the high prices which East Indian sugar, tobacco, tea, rubber, copra, coffee, and tin realized bolstered up the strong financial position of Amsterdam and maintained the vigorous development of the East Indies.

At the junction of the Rotter river with the Rhine (New Maas), the site of Rotterdam (582,000 inhabitants) may be compared with the sites of Hull and Liverpool, where important harbours grew up at points where small creeks entered

¹ The Merwede Canal supplanted an older canal between Amsterdam and Utrecht, which had made use of the little river Vecht. The original canal varied in depth, and was subject to private tolls. The new canal was made at the end of the nineteenth century, but on grounds of national defence the most direct route was not chosen, and the trade with the Rhine was hampered. Recently, however, it has been decided to construct a new ship canal to allow vessels of 3000 tons to reach the Waal. This will increase Amsterdam's share of the Rhine traffic.

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swiftly flowing estuaries and gave shelter to small ships. At the beginning of the nineteenth century the Rhine had many estuaries which were largely choked with silt. At that time the chief items of trade at Rotterdam were wheat, for the manufacture of gin, and madder obtained from the Meuse valley. In 1820 the population numbered 53,000, and it was not until the river was dredged in 1866 that Rotterdam began to develop an overseas trade. Since that date the depth of the channel has been increased from ten to thirty-three feet at low water, so that the largest ocean-going cargo-liners can enter the port.

The opening of the Rhine mouth made Rotterdam the principal port of the Rhine valley. Land for docks was both level and cheap, and as the tidal variation is only about five feet huge harbours have been made which can be entered from the river without the use of locks. This easy accessibility has made for cheap freights and rapid loading, so that Rotterdam has become the great transit port for the bulk cargoes which enter the Rhine valley. Grains, ores, and raw materials form the chief cargoes handled, and the rise of the Rhenish-Westphalian coalfield and the German iron and steel, textile, and chemical industries has given Rotterdam the hinterland needed by a world-port. Rotterdam handles about 53,500,000 tons of goods each year, but of this less than 1,500,000 tons are carried by rail. The water-borne traffic includes 18,000,000 tons of coal, half coming by river from Germany and South Holland and half from Britain. Fourteen million tons of iron ore from Spain, Algeria, Newfoundland, and Sweden are sent upstream, together with large quantities of wheat, timber, petroleum, sugar, and fertilizers. More than three-quarters of Holland's trade with the Rhine passes through Rotterdam, but since the War the position of the port has been somewhat less favourable.

The depreciated currencies of Belgium and Germany led to the rise of Antwerp over Rotterdam. The exceptionally low rates (*Ausnahme Tarife*) of the German railways have reduced Rotterdam's share of the German traffic, which has been partially diverted to the German North Sea ports. The Belgian Government has paid towing charges from Dordrecht

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to Antwerp on goods going to or from Alsace-Lorraine. France levies surtaxes on Strasbourg traffic passing through Rotterdam, while traffic through Antwerp is exempt. In 1924 the surtax amounted to 33·6 francs per ton, so that, as the freight from Rotterdam to Strasbourg is from 25 to 40 francs per ton, free transport would not have allowed Rotterdam to compete with Antwerp.

Though Rotterdam has lost the trade of Alsace-Lorraine, it should be noted that more than a quarter of the barges which discharge at Mannheim belong to Holland. Moreover, Rotterdam has gained by the opening of canals on the Maas, Main, and Neckar, while the German Midland Canal gives access to Hanover and Magdeburg, and it has retained its importance in the handling of cotton and woollen piece goods. Thus, while the actual traffic in bulk goods shows a slight decline, the export of manufactures is increasing, and it should be noted that Rotterdam is not merely a transit port. More and more of the cargoes of grain, ores, vegetable oils, oil-seeds, cotton, and hides are retained for manufacture in Holland, which possesses the advantages derived from its central position, its free market, its ownership of the East Indies—a reservoir of primary products needed in modern manufacturing—and its excellent shipping, railway, and road motor services. In 1927 Holland's overseas, including colonial, trade amounted to about 145,000,000 metric tons, and the river traffic to about 75,000,000 metric tons, figures which reveal the extent to which the Dutch nation is engaged in a general merchandizing business, buying and selling as the need occurs or as the markets indicate. It may be said that Holland is the commercial balance wheel of Europe. Like Belgium, the Netherlands are protected from foreign aggression by the jealousy of the great European Powers, but should war break out there is little doubt that the Dutch are still willing to flood large areas of their country in order to maintain the independence which they won at such great cost against the aggression of Spain, and later of France.

CHAPTER XV

SWITZERLAND

SWITZERLAND is a continental state and has no direct access to the sea. It is bounded on the north by the Rhine, on the west by the Jura Mountains, and on the south and east by the Alps, while Lake Constance separates it from the Alpine Foreland of South Germany. Its transitional character justifies its inclusion both in North-west and in Central Europe. Judged by its industrial development and density of population, Switzerland forms part of the economic region of North-west Europe, and more than nine-tenths of its people speak either German or French, though physically it is a part of the highlands of Central Europe. Conquered in succession by the Romans, Germans, Burgundians, and French, the population is of a mixed character. Its mountainous nature and the lack of easy communications encouraged the growth of autonomous towns and rural communities in the Middle Ages, so that when in the thirteenth century the Habsburgs endeavoured to check the independence of the Lucerne cantons there came into existence a primitive alliance which grew in its vigorous defence against Austria and Burgundy into a strong federation of small states. Its attitude of permanent neutrality was adopted in the sixteenth century, and its independence was recognized by the Treaty of Westphalia, which put an end to the religious wars. It was not until the French Revolution, however, that the separate cantons adopted uniformly democratic forms of government. Without political ambitions, and accustomed to reconciling different opinions which arise from the variety of its religions and nationalities, Switzerland is a congenial centre for the activities of the League of Nations. As in the uplands of South Germany and Austria, Switzerland possesses a variety of local climates, but throughout, on account of its elevation, the daily extremes are greater than in the lowland areas of Western Europe.

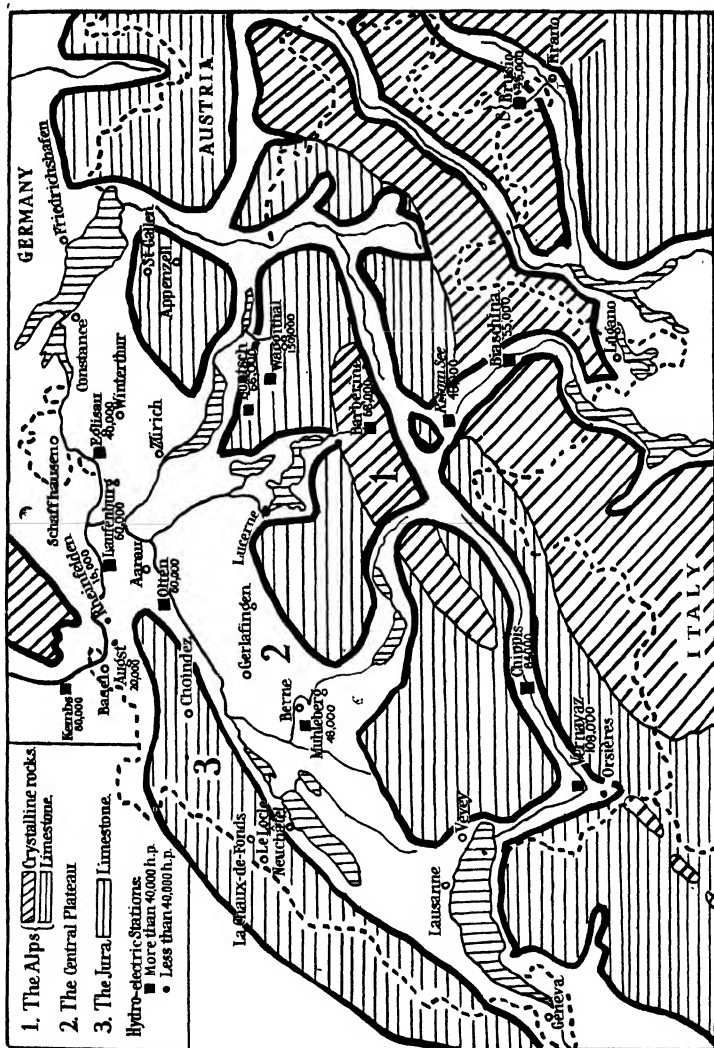


FIG. 53. PHYSICAL REGIONS OF SWITZERLAND

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PHYSICAL REGIONS

Three physical regions may be distinguished.

1. The Alps, which occupy 60 per cent. of the total area, consist of highly folded and overfolded mountain masses of Tertiary uplift. In some areas the erosion of overfolds has left older rocks superimposed upon younger ones sixty miles away from their point of origin. The Central Alps consist of crystalline masses, 12,000 feet or more in height, from the upper surfaces of which great thicknesses of younger rocks have been worn away. This line of crystalline peaks forms

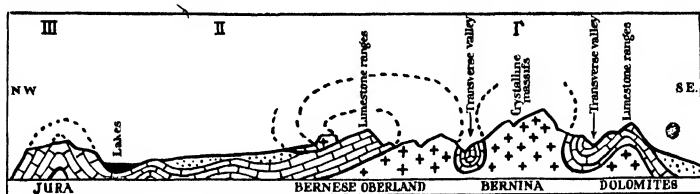


FIG. 53. GENERALIZED SECTION ACROSS SWITZERLAND

I, Alps; II, plateau; III, Jura.

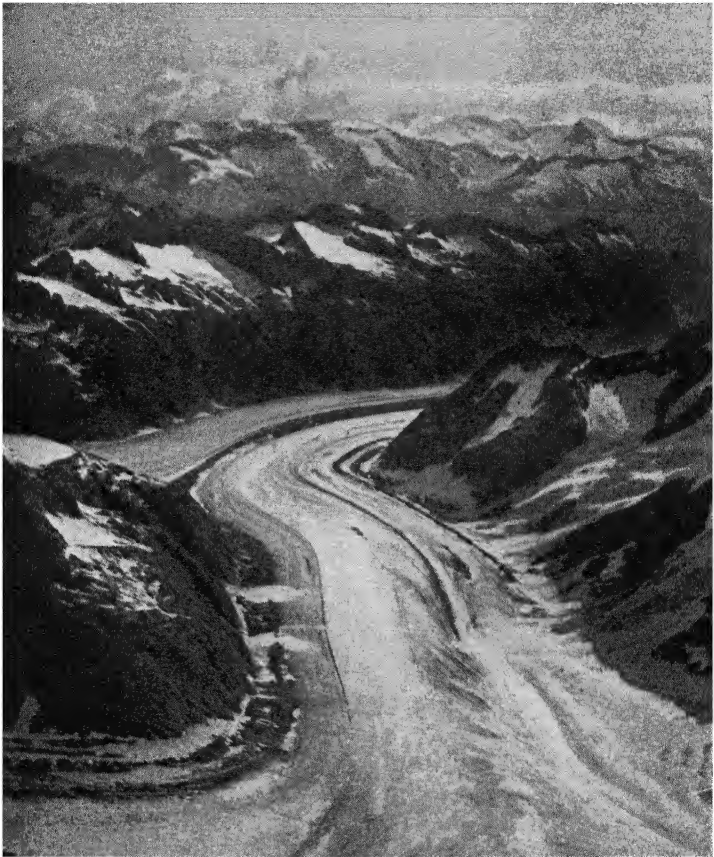
a double chain which stretches from the Maritime Alps of Italy through the Mont Blanc, Matterhorn, Gotthard, and Bernina groups into the Eastern Alps of Austria.

Roughly parallel with the central core of crystalline rocks, lie limestone ranges of chalk to the north and south. The Alps of Dauphiné, Savoy, and the Bernese Oberland are separated from the Central Alps by deep longitudinal downfolds, which determine the courses of the upper streams of the Rhine and Rhône, while the short, transverse valleys give through communications between Switzerland and Italy. South of the crystalline massifs the north-facing escarpment does not form mountainous country until the Bergamo Alps are reached, but beyond these the southern limestones broaden out into the great groups of the Dolomites, Carniola, Julian, and Karawanken Alps, continuing on the east of the Adriatic as the Karst country of Istria and the Dinaric Alps.

The Alpine ranges are covered by forest and pastures

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which form the bases of the principal occupations of the inhabitants. The scattered nature of the pastures has fos-



**FIG. 54. THE FINSTERAAR GLACIER FROM THE SUMMIT OF
THE FINSTERAARHORN**

Note the jagged outline of the frost-riven peaks and the medial and lateral moraines.

By courtesy of the Swiss Federal Railways. Photo T. Maser, Lucerne

tered the development of small peasant ownership, and the area of the average farm is about twenty-two and a half acres. The breeding of cattle and the production of milk

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products for export form the chief industries in the Alps which lie to the south and south-west of Lucerne. In the Rhône basin there are many vineyards and mulberries, and olives are grown in the south, in the Ticino valley. Everywhere the steeper slopes are planted with conifers, but the amount of lumber produced is little more than a quarter of the amount consumed, and there are three times as many people employed in the wood industries—toys, furniture, shoes, brushes, and parquet-floor material being made—as are engaged in the forests and sawmills. There is no export of timber from the Alpine region. In fact, the forests seldom extend above 6000 feet, and there are large areas of bare rock where even the Alpine plants cannot exist.

Every grass-covered slope is utilized, and in the spring the peasants leave their valley villages for the broad grassy shelves which overhang the deep valleys. The cattle are taken to still higher slopes as the snow melts in summer, and in August and early September hay is cut and cheese made before the cattle are brought down to the valleys. The valleys of the Bernese Oberland specialize in dairy products, 47 per cent. of the milk being exported in the form of condensed milk, cheese, butter, and milk chocolate. Of the total output of milk 35 per cent. is made into condensed milk, the principal condensing-plants being at Cham and Vevey. The sterilizing process is centred at Stalden (Canton Berne), and the milk-powder industry at Vaudens, Cham, and Hochdorf. Cheese-making absorbs the greater part of the remainder, the cheeses being exported to Germany, the United States, Italy, France, Britain, and Austria. The chocolate industry is more than a hundred years old, and has spread from French Switzerland.

The central area, round the Jungfrau and the St Gott-hard, is scantily populated, and owes most of its importance to the tourist industry, which has been estimated to be worth £50,000,000 each year to Switzerland. The superior climate of the Italian slopes and the winter snowfall of the upper Inn are responsible for the great popularity of Lugano (15,000 inhabitants) and the Engadine. In the north-east the home industries have been intensified by the develop-

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ment of hydro-electric power on a large scale, Glarus, St Gallen, and Rapperswil being the centres of important textile and engineering industries. The manufacture of cottons, artificial silk, and embroidery has made the country between Lake Zürich and Lake Constance an important industrial district. Nearly half the population of the Alpine region



FIG. 55. A TYPICAL GLACIATED VALLEY

The valleys formerly occupied by glaciers are frequently flat-bottomed, with steep walls. Above these walls are ledges which are used as summer pastures.

By courtesy of the Swiss Federal Railways

Photo by O. Hari, Kandersteg

lives below 2500 feet, and more than three-quarters below 3500 feet, above sea-level.

In medieval times the Alpine passes were crossed by mule-tracks, which were replaced by roads at a later period. In the west France was linked to Italy (Piedmont) by the Col de Fréjus. The Eastern Alps were traversed by the Brenner route, while the central passes, in the Simplon and St Gotthard districts, between Switzerland and Italy were impassable in winter. By these more direct routes the cost of transport was greater from Switzerland to Italy than by the Brenner and Cenis routes because of the absence of roads.

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The St Gotthard road was constructed in 1830, but it was generally covered with snow by the end of October, and winter transport was dangerous.

The building of the Cenis railway tunnel led to the construction of the Gotthard Tunnel. The carriage road across the Simplon was made by Napoleon at the beginning of the nineteenth century, but because of the high cost of maintenance was allowed to fall into disrepair, and became almost impassable on the Italian side. The success of the St Gotthard route encouraged the promotion of the Simplon and Lötschberg Tunnels, and these have become extremely important during the present century. The building of the Alpine tunnels stimulated the development of both Germany and Italy, and these countries no longer purchase from Britain goods for which London was formerly the chief *entrepôt*—e.g., silk. Other Alpine passes have declined in commercial importance, though the recent development of high-powered motor-cars has given rise to summer traffic on many of the mountain roads.

The chief towns occupy nodal points on the great transalpine railways, except in the north-east, and especially in St Gallen, which is the most densely populated part of the Alps. Chur (15,000 inhabitants), at the junction of the Rhine-Rhône and Bernina-Albula railways, is the only considerable town in the Alpine zone of South-east Switzerland. The passes focus the great transalpine traffic into a few highly important railway routes, which carry both passengers and goods from Germany and France on the one side to Italy and Austria on the other. Fortunately the great amount of water-power available makes it possible for electric engines to draw heavy trains through the Alpine sections without risk of discolouring the snow.

Important developments have taken place in recent years in the hydro-electric power industry in the Alpine region. Before the War little more than half a million electrical horse-power were produced, chiefly in a large number of small stations, only six producing more than 10,000 horse-power. At the present time most of the power is produced by forty-five large stations. The power developed is about

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1,300,000 horse-power, less than a quarter of the potential development. Nevertheless, 97 per cent. of the population is supplied with electricity, while more than half a million horse-power are exported to other countries.

2. The **central plateau**, occupying 30 per cent. of the total area, is undulating country, consisting of worn-down folds and overfolds of Secondary and Tertiary age, average 1500

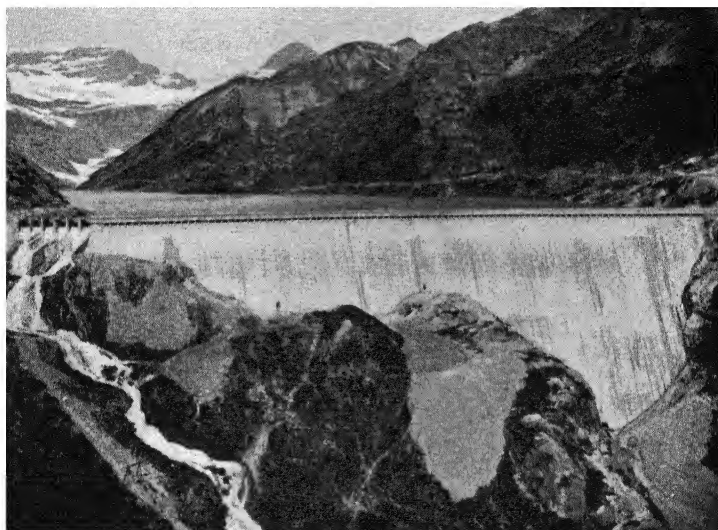


FIG. 56. THE BARBERINE RESERVOIR

The water is led through pipes to the turbines which generate the electricity.

By courtesy of the Swiss Federal Railways

feet in height. The subsoils are frequently unfertile, but large areas are covered by glacial soils—loess and clay—which make this the chief agricultural area, with a density of population of more than 500 people per square mile. Cereals, chiefly wheat, and potatoes are the principal crops, but much of the arable land is now under grass because of the increased industrialization. Cultivation is mixed, and oats, rye, vines, and root crops and sometimes maize are

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frequently found in the same field. Vines are grown on southern slopes, and there is a large output of wine. Because of the nature of the surface considerable areas are under timber¹ and fruit-trees. The cultivation of sugar-beet and potatoes was greatly extended during the War, but Switzerland is now compelled to depend to a great extent on imports.

The only important industrial crop is tobacco, but the quantity of home-grown tobacco is small in comparison with the amount imported. By far the most important branch of farming is the breeding of cattle for milk, meat, and the export of pedigree stock. There are now more than 1,500,000 cattle in Switzerland, four for every ten inhabitants. The principal cheese markets are at the points where the Alpine valleys enter the plateau—*e.g.*, Berne, Lucerne, Zürich, and St Gallen. These centres also act as markets for the fruit, 40,000 tons of which are exported annually. The present tendency is for the export of condensed milk to be displaced by that of milk chocolate, especially near Vevey, Berne, and Neuchâtel.

Practically all the larger towns belong to the Swiss plateau. The chief city of the plateau is Zürich (249,000 inhabitants), the largest town in Switzerland. Being the centre of the Swiss railway system, it is more than a local market in that it commands routes to Vienna, Milan, Berlin, and Basel, and it has become the greatest industrial and commercial town, with important textile, dyeing, chemical, and engineering works. Berne (111,000 inhabitants), the federal capital, was originally an Imperial city in an easily defended situation in a bend of the Aar. Its clock-making originated in the wood-carving of the Bernese Oberland. It manufactures cotton and silk goods, while metal watchmaking has been followed by the motor-car industry. Geneva (143,000 inhabitants), commanding the Rhône valley route into France, is the chief town in French Switzerland, and is the market for the wine, orchard, and dairy country round Lake Geneva. Its manufactures should be noted, and its political

¹ Forests occupy 22 per cent. and grasslands 55 per cent. of the total area of Switzerland.



FIG. 57. AMSTEG POWER-STATION
By courtesy of the Swiss National Tourist Office

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importance as the headquarters of the League of Nations. Lausanne (76,000 inhabitants) owes its rapid development to its command of the Simplon-Lötschberg route. Other route centres are Neuchâtel (23,000 inhabitants) and Lucerne (47,000 inhabitants), the latter in an excellent situation for tourist traffic. Basel, or Bâle (147,000 inhabitants), at the junction of the Rhine Rift Valley, the Swiss plateau, and the Paris basin, is to the Western what Vienna is to the Eastern Alps. A Roman outpost near the great fortress of Augst, it became a bishop's seat at an early date and a centre of commerce. Its strong position allowed it to resist attacks, and it became a noted centre of banking. For centuries it has been the limit of commercial navigation of the Rhine. With the development of larger vessels and the cheapening of railway freights, it was found that, owing to the swiftness of the current and the limited period—five to seven months—during which navigation is possible, the cost of river transport upstream was almost as great as by railway.

Early in the nineteenth century Basel was visited by Rhine steamers, but with the improvements in the river below Strasbourg the navigation between Basel and Strasbourg became worse, and Swiss river traffic practically ceased. The traffic of this section increased from 300 tons in 1903 to 286,000 tons in 1924, but in the following year the river was unusually low, navigation being open for only 120 days (*cf.* 180 days in 1924). In 1927 the tonnage of the port of Basel reached three-quarters of a million. The actual amount of traffic depends on the rainfall. The greatest bar to traffic was the Barr d'Istein, but this is avoided by a canal, and 2000-ton barges can reach Basel at the present time. As 11,000,000 tons pass through Basel by railway each year, the development of navigation up to its docks will be of the greatest economic importance to Switzerland, as bulky goods will be able to reach the heart of Europe cheaply. It is estimated that nearly 2,000,000 tons of goods will be unloaded at the Kleinhüningen docks, especially coal, grain, steel, and copper, while one-tenth of the boats proceeding downstream will carry Swiss exports. Grain silos have been

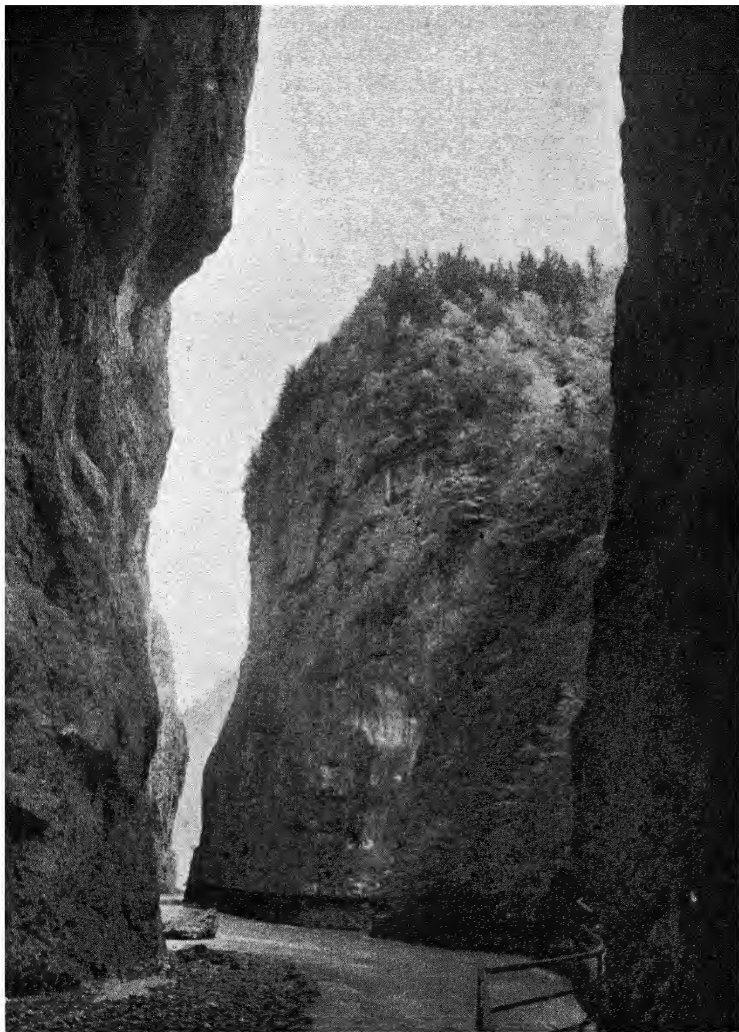


FIG. 58. AAR GORGE, MEIRINGEN

Many of the Swiss rivers have etched deep channels in the surface of the plateau of Central Switzerland.

By courtesy of the Swiss Federal Railways

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built and a shipyard has been laid down at Augst. Briquettes are made from coal and pitch imported from Germany, and large quantities of salt are mined in the neighbourhood.

3. The **Jura Mountains**, which occupy one-tenth of the surface of Switzerland, consist of simple folds of Jurassic rocks, the synclines containing deposits which absorb the rain, so that the region is poor in rivers. In the south the

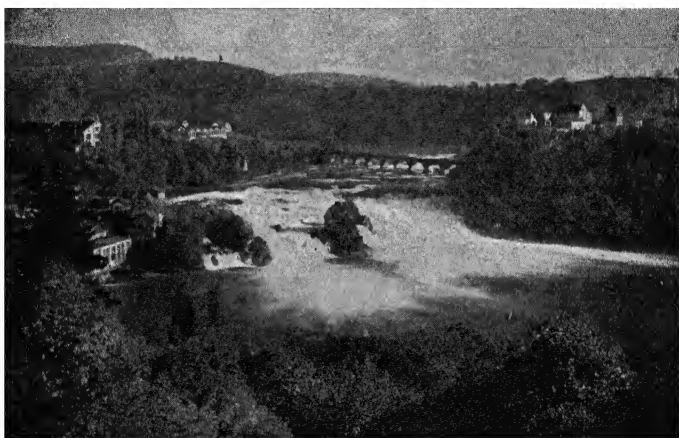


FIG. 59. SCHAFFHAUSEN

By courtesy of the Swiss National Tourist Office

Jura ends in a great mountain wall which stretches from Geneva to beyond Solothurn. As in other Jurassic districts, iron ores are found in the Delémont area, and the blast-furnace of Choindez has been replaced by electric furnaces. In the Val de Travers asphalt is still mined, though the output has greatly declined since 1919. The Jura are clothed with forests and pastures, and dairying is very important. The forest areas of Central Europe developed wood-carving, furniture, toy, and clock industries at a very early date. Jewellery was made at Geneva, and watchmaking began there in the sixteenth century. This industry spread to the Jura, and thence to Neuchâtel. It is the most important industry in the Swiss Jura, and particularly in the high

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valleys of Le Locle and La Chaux-de-Fonds (35,000 inhabitants). Together with the manufacture of gramophones and jewellery, the industry employs 60,000 people. Fifty years ago more than half the watchmakers worked in their own homes, but now three-quarters of them are employed in factories. Nearly 20,000,000 watches are exported annually, and find their principal market in the United States, the home of the Ingersoll.

INDUSTRY AND COMMERCE

The most important feature of modern Switzerland is the development of large-scale industries. Swiss manufactures date from the thirteenth century, and throughout the Middle Ages there were successive streams of refugees from the religious persecutions of France and Italy. It was through them that the silk industry was begun at Berne and Zürich and watchmaking at Geneva. Swiss neutrality also played its part, and the treaties under which Swiss mercenaries served abroad stipulated for real advantages in favour of Swiss merchants. During the seventeenth century Switzerland ranked with Britain and Holland in respect to industry and finance, but it was not until the latter part of the nineteenth century that agriculture began to decline. From 1850 to 1875 the condensing of milk and the manufacture of cheese for export threw land out of cultivation, and the progressive improvement of the standard of living has made it necessary for immigrant labour to be obtained from neighbouring countries for the lower grades of farm-work.

Swiss industry labours under many disadvantages. It possesses practically no coal, is almost entirely dependent on raw materials imported through the ports of foreign countries, and it has only a small home market, while labour costs are high. The cost of raw materials is above the general level of world-prices. The larger industries depend for their existence on foreign markets, and there are no Swiss colonies. The most serious disadvantage, however, is the absence of coast ports, which results in a much greater cost of rail transport than similar industries in other lands have to bear.

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Export manufactures are chiefly those in which the finished product is of high value in proportion to its bulk. There are, however, several reasons for the active development of Swiss industry: (i) The abundance of water-power has made it possible to substitute machinery for manual labour, and hydro-electric power can easily be transmitted to districts where costs are relatively low. (ii) Labour is both skilled and relatively cheap, although a good deal of immigrant labour is now employed in the cotton-mills. (iii) Technical efficiency on the German model is promoted in the schools to a much greater extent than is common in Europe. (iv) Switzerland commands trunk-routes from east to west and from north to south, and is in a position to negotiate commercial treaties on equitable terms with her neighbours. Unlike Holland, Belgium, and Britain, which have up to the present retained a general policy of free trade, Switzerland has been compelled to adopt protective tariffs, though these are generally lower than is usual in Continental Europe. (v) Finally, the fact that the Swiss possess three languages is of great importance in the development of commerce, with the result that Switzerland possesses a value of foreign trade per head of population greater than that of any other country in the world.

The value of Swiss exports is more than £60 per ton (*cf.* Italy £50, Britain £5), four-fifths of the exports consisting of manufactured goods. Nearly one-third of the total export is made up of textiles. The earliest textile industry, linen, based originally on locally grown flax, dates from the fourteenth century, and is now carried on in the cantons of Berne and Aargau. The introduction of machinery in Belgium and Ireland caused it to decline. Woollens were also manufactured at an early date throughout the Alpine Foreland, but the relative unimportance of sheep in Switzerland makes the woollen industry of little value at the present time, the chief products being knitted goods for home consumption, though there is a small export of fine materials.

Silk and cotton are the principal textile manufactures. A little raw silk is even produced in the Ticino, but most of the material used is imported from Italy and France. Silk-weav-

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ing is centred round Zürich, nine-tenths of the output being exported chiefly to Britain, Canada, Australia, and the succession states of Austria-Hungary. Artificial silk is made near Zürich and Basel, the latter town specializing in silk ribbons. Cotton-spinning began in the seventeenth century, but during recent years has declined, the yarn being imported from Austria, which now has a superabundance of spindles. The chief cotton centres are in North-east Switzerland and in Zürich, Glarus, and St Gallen. Most of the yarn is absorbed in the local weaving, knitting, and embroidery industries, though a good deal is exported to Germany and France. Embroidery is made by machinery round St Gallen, while hand-made embroidery is still thriving at Appenzell. Boots and shoes of fine quality are made near Zürich and Aarau for export. Fifteen per cent. of Switzerland's exports consist of metal goods and machinery. Machine factories came into existence in the repair shops of the textile industry, and as the need arose machine tools, hydraulic wheels, and turbines were constructed. Steam-engines were adopted early in the nineteenth century, and the industry is still carried on at the earliest railway centre, Winterthur (54,000 inhabitants), as well as at Zürich, the modern centre of Swiss railways. Finally, during the present century electro-technical industries have developed, especially at Baden, Oerlikon, and Geneva. Before the War two-thirds of the output of machinery was exported, but the large-scale electrification, especially of the railways, at the present day leaves less for export. Turbines of approximately 1,900,000 horsepower have been installed for use in Switzerland alone, but there is a growing export, while steam turbines, though not used now in Switzerland, are also manufactured for export. Imported bauxite and locally produced hydro-electric power are used in the aluminium-works of Neuhausen (Rhine) as well as in the Alpine districts of the upper Rhône at Chippis and Orsières. The electro-chemical products include fertilizers, soda, and carbide. Dyes are produced at Basel.

The widespread utilization of hydro-electric power gives rise to a type of industrial society which owes little to urban concentration, and there is nothing to compare with

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the overcrowding of such an area as South-east Lancashire. Wherever possible the industries are localized where transport is relatively easy and power is transmitted considerable distances. The result is that the country is almost smokeless, and the robust health of the nation is obvious to the casual visitor from the coalfield areas of Britain, France, and Belgium. Judging by the merry songs of the parties of workers returning from their week-end excursions in the woods and mountains, the Swiss are a happy and athletic people, who lose little by comparison with our own countrymen.

CHAPTER XVI

GERMANY: GENERAL CONSIDERATIONS

To understand how the area known as Germany became a national and economic unit it is necessary to realize that the geographical conditions of the great European plain have been modified considerably during historical times. At the beginning of the Christian era practically the whole of Germany was covered with forests, marshes, and heaths. Iron tools were in use, but the clearing of the forests was a slow and difficult process, as there was no dry season during which the woods could be destroyed by fire. Life was based on small forest clearings, and the small settlements were often widely separated, except in those parts where the nature of the soil made tree growth impossible. Little patches of corn were grown in clearings, and the food-supplies were augmented by hunting in the surrounding woods or by keeping a number of cattle and sheep. In the forests transport was difficult, ideas spread slowly, and little wars between rival tribes were frequent. Gradually, however, the pressure of the peoples from the steppes and the uplands made itself felt, and the more open ways of migration along the morainic ridges of Northern and Central Germany brought the forest tribes into closer contact with one another and caused an infusion of blood of the Alpine racial stock into the Nordic peoples. In the south of the plain patches of fertile loess became the homes of more settled groups at a somewhat higher stage of civilization, and it was along this southern route that the tribes eventually poured into the western part of the plain and into Northern France. The Rhine valley provided an easy route from north to south, and parts of it were used by the Franks as an area of concentration before they assaulted Gaul and threw back the Saracen invaders of Western Europe.

For centuries the organization of the German settlers was

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based on that of the forest clearing, as is the case at the present time in parts of North America. The spread of Christianity eventually gave rise to the idea of empire, and throughout the Middle Ages first one and then another military group made itself master of "the Holy Roman Empire." Everywhere the organization of society was feudal, and each little state tried to become economically independent of its neighbours; in fact, many of the present industries owe their origin to the patronage of some petty ruler.

Germany was the latest of the Great Powers to achieve national unity, and her feudal past is well illustrated by about half a million of her people being still engaged in scattered domestic industries. About two-thirds of the domestic workers are employed in the textile and clothing trades, though the present tendency is for these to be localized in the large towns, and especially in Berlin, the chief clothing centre. In Thuringia local handicrafts are combined with agriculture and stock-rearing. Weaving is carried on in the Lausitz Riesengebirge and Eulengebirge districts, leather-work is important in the Odenwald and the Bavarian Palatinate, while small metal industries are carried on in the Black Forest and Erzgebirge. Wood-carving is widely practised in the South German uplands and in the Baltic ridge country, the Bavarian Alps being famous for the making of violins. The most characteristically German home industry, however, is the making of toys. This appears to have originated in the Nuremberg and Sonneberg districts, and has spread to many parts of Brandenburg and the Rhineland, where it is now carried on in factories. West of the Elbe agricultural development resembled that of Holland, the farms being small and intensively cultivated, the fields being separated by ditches. East of the Elbe the arable land was generally less densely populated, the estates being large and cultivated in open fields, with a three-field rotation. Farther east there were a number of Slav settlements of less regular outline, and beyond the Spree the Slavs spread down the valleys across the main route of German colonization.

It was not until the nineteenth century that feudal condi-

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tions were swept away, but to a very great extent Germany has benefited by the lateness of its development. After the Thirty Years War German commerce and agriculture declined, but when new methods were established in other countries they were used in the reconstruction of German agriculture. The English fashion of deep ploughing was introduced, and stall feeding was adopted after it had proved successful in Flanders. The introduction of root crops, and especially of potatoes, proved more successful in Germany than anywhere else in the world. By 1831 there were 23,000 distilleries in Prussia, and soon afterward fertilizers were imported, and Germany began to export corn, meat, and dairy produce.

Before the World War German farming had so far overcome the natural disadvantages of soil and climate that higher yields were obtained than for corresponding crops in the United Kingdom. This is shown in the following table:

YIELD PER 100 ACRES	
BRITAIN	GERMANY
Food for 45-50 people	Food for 70-75 people
15 tons of cereals	33 tons of cereals
11 " " potatoes	55 " " potatoes
17½ " " milk	28 " " milk
4 " " meat	4½ " " meat

Further, in spite of the rapid increase of population after 1895 the total food-supply did not alter materially.

Road-building began in 1845, and the rivers were gradually freed from tolls. The Rhine had been freed during the Napoleonic wars, but cargoes on the Elbe paid no less than fourteen different tolls between Hamburg and Magdeburg, a condition of affairs comparable with that in China. The absence of good roads stimulated the construction of railways, and, as was also the case in America, Germany procured her railways quickly and cheaply, the average cost per mile of track being less than one-third of that in England. It was not until after 1870, however, that the development of the coalfields and of the iron-mines of Lorraine enabled Germany to become a great manufacturing nation.

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Political unity came as a result of the improvement of communications by river, canal, post-road, and especially by the construction of railways, which made economic unity possible.

Between 1870 and 1890 Germany was changed from a food-exporting into a food-importing country, and the rapidly expanding home market stimulated agricultural production. As in France, Holland, and Denmark, rural co-operation became important, and in North-west Germany and Prussia co-operative banks have eliminated the village usurer (*cf.* Russia). By the beginning of the present century German industry was strongly organized in trusts and cartels. Emigration had practically ceased, and Germany was becoming more and more dependent on immigrant labour. Between 1870 and 1913 the proportion of the population living in towns had increased from 26 per cent. to 60 per cent., that dependent on agriculture had declined from 42 per cent. to 28 per cent., while the proportion engaged in industry and mining had increased from 35 per cent. to 43 per cent. Nevertheless, though industry and trade directly maintain more than half the people of Germany there are still large numbers who have agriculture to fall back on during periods of industrial depression.

INDUSTRIAL DEVELOPMENT

During the nineteenth century Germany became increasingly dependent on foreign sources of raw materials and food-stuffs. These were obtained from the European colonies which were being opened up in Africa, America, and Australia. After 1840 Germany no longer produced a surplus of wool for export, and at the present time less than one-tenth of the wool consumed in the mills of Berlin, the Rhine provinces, Hanover, Saxony, Silesia, and Thuringia is of German origin.

As in the case of iron, the large number of separate cotton centres is due to the former separate economic life of the constituent states of the German Republic. Bavaria has cotton-mills at Bayreuth and Hof, Württemberg at Stuttgart

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and Ulm, and Silesia at Breslau. At first, because of the limited purchasing capacity of the German colonies, there was little export trade in cotton goods (*cf.* France's valuable colonial markets in Africa and Asia). Other industries owe their existence either to princely patronage, as in the case of the silk industry of Krefeld, or to the localized skill of independent craftsmen, as in the case of the boot industry of Pirmasens.

The growth of modern industry followed the development of the railways and inland waterways, and is due primarily to the existence of large and easily accessible supplies of coal and salt. Between 1870 and 1913 the annual output of coal increased from less than 30,000,000 tons to 140,000,000 tons, while during the same period the output of potassium salts increased from 2000 to nearly 10,000,000 tons. By 1913 there was only one other European country, Britain, where the output of heavy chemicals was greater than that of Germany, while in the production of fine chemicals and dyes Germany stood alone. Her production of iron and steel ranked second to that of the United States, though little more than half of the ore used was mined in Germany. By 1913 Germany had become the greatest manufacturing nation in Continental Europe.

EFFECTS OF THE WORLD WAR ON GERMANY

At the outbreak of the World War Germany had to feed not less than 20,000,000 people with imported food, and the close of hostilities found her exhausted, her people demoralized and starving, and her industries crippled. The present population is greater than in 1913, but the area of the country is less, the lost areas being the chief producers of food (Posen) and raw materials (Alsace-Lorraine). Part of the pre-War import of food and raw materials had been paid for by the interest and dividends on German capital invested abroad. This capital has been lost, as well as the German colonies, which occupied an area of more than 1,000,000 square miles, with 12,500,000 inhabitants, who supplied some of the raw materials. Instead of receiving from abroad

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each year as interest and dividends on investments food and raw materials to the value of 1,500,000,000 marks, Germany had to pay under the Dawes scheme no less than 2,500,000,000 marks—that is, a total difference of 4,000,000,000 marks (£200,000,000), which has to be earned by exports. In Europe there are twenty-six national markets, each far narrower than that of the United States, and endowed with far less purchasing power, and the German manufacturer cannot widen his basis of production very much. As in other European countries, he tries to reduce wages to a minimum, thereby impoverishing his home market, and indirectly reducing the standard of living. It is obvious therefore that the Young Plan to define Germany's reparations payments directly affects every European country, and has brought into the sphere of international politics the conception of an economic federation of Europe.

Currency depreciation has taken place in almost every European country, and where stabilization has been accomplished it has been at an unfavourable rate of exchange. In all countries with stabilized currencies employment is uncertain, taxation is crushing, and saving to form new capital is slow. It is impossible to solve the problem by intensifying the competition for overseas markets, but by creating new markets within Europe itself such under-developed areas as Yugo-Slavia might be encouraged to provide more foodstuffs and raw materials. The standard of living of their people might be raised in order that they can absorb more of the surplus industrial output of Western Europe. As Europe is at present constituted, every country has to solve the same problem single-handed, and in no other country have such efforts been more successful than in Germany. Despite the loss of more than one-eighth of her European and the whole of her colonial territory, Germany's economic position has rapidly improved, and her industries have almost recovered their pre-War importance.

By the Treaty of Versailles Germany lost one-fifth of her area under wheat, corn, beet, and potatoes, one-tenth of the farm animals, three-quarters of her iron and zinc deposits, and the whole of the potash of Alsace. One-quarter of her

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coal-mines and lead-mines were handed over to her former enemies, together with nearly half of the blast-furnaces and steel-works and one-tenth of the textile factories. The problem of supporting her population has been complicated by the arrival of Germans from those parts where territory has been lost.

As the area available for development is less and the density of population greater, it is necessary for agriculture to become more intensive, but this involves a greater dependence on fertilizers. In the fixation of nitrogen from the air Germany has made herself independent of Chile nitrate, and even exports large quantities. To minimize the quantity of phosphates imported the basic slag industry has been more fully developed, but in spite of all efforts to cheapen the cost of production more land has been put under sheep, and prices remain high. Excessive taxation and the absence of working capital, reserves, and credit restrict purchasing power, and make it difficult for farmers to market their produce at home. Consequently agricultural exports have increased, large numbers of cattle, together with grain, meat, and dairy produce, being marketed abroad. -

To reduce the import of textile fibres the German chemical industry has developed the manufacture of artificial silk, using German forest-lands to maintain the supply of pulp. Benzol is produced on a large scale to take the place of imported petroleum, but up to the present the effect of Germany's reorganization of her industrial life has been merely to postpone a great financial crisis. Her apparent prosperity would vanish if she forfeited the confidence of her foreign creditors.

Germany, however, still possesses many of the advantages which gave her such a commanding position in pre-War industry. Cheap and skilled labour is available, large reserves of coal and water-power are being developed, and the organizing capacity of the German nation is unimpaired. Faced with the loss of more than a quarter of her coal reserves, Germany has set to work to develop her deposits of lignite. As the seams lie close to the surface, all that is necessary for the lignite to be worked is for the overlying

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soil to be removed by mechanical strippers, the soft brown coal being quarried by machinery. When dried lignite is liable to crumble into powder, and this makes it unsuitable for transport to distant regions. Nevertheless, it is valuable as a source of electricity, and can be converted into patent fuel if suitable binding material is procurable locally. Much of the German lignite is self-binding, and in certain industries is found to give even better results than coal. It is used chiefly in the nitrate and glass industries, and at the present time nearly half the public electricity supply is generated from power derived from lignite (*cf.* 23 per cent. in 1914). Distribution lines are now being set up to provide cheap electrical power throughout the length and breadth of the German Republic.

The rivers of Bavaria alone possess two million potential horse-power, of which nearly half has been developed. Groups of hydro-electric stations on the Alz, Inn, Isar, Lech, and Iller supply cheap power throughout the triangle Munich-Stuttgart-Nuremberg. There are other hydro-electric stations in the basins of the Neckar and the Rhine which will be linked with those of the Rhine uplands—*e.g.*, at Kamberg, in the Lahn valley—and with the lignite districts of the lower Rhine. At present, however, the German-Swiss stations and those of the Black Forest merely supply the towns of the Neckar, Main, and Ill. High-tension transmission lines are also being constructed in Thuringia and throughout the Saale basin. These are to be connected with the existing coal and lignite power-stations of Saxony, the Lausitz, and Silesia.

The greatest single power centre in Europe is the Rhenish-Westphalian coalfield, which has an ever-increasing radius of action. It is proposed to link the Ruhr with the Osnabrück and Hanover coalfields, and it has even been suggested that the peat moors of the North Sea and Baltic plains may be made to contribute to the national supply of power, though whether peat can be utilized profitably is doubtful. The fact remains that Germany is developing power in a fashion which leaves no doubt as to her intention to regain her position as one of the greatest manufacturing countries of the world.

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Apart from the coal, iron, zinc, and potash lost in the regions ceded to Belgium, France, and Poland, Germany retains the greater part of her supplies of minerals. The older rocks supply glass sands, kaolin, and graphite, while many of the old metalliferous mines are still worked for sulphur, and even for copper, lead, and zinc. The salt deposits lie close to large fields of lignite, and the output of chemical manufactures at Ludwigshafen, Elberfeld, Höchst, and elsewhere is of the greatest importance. Before the War Germany's monopoly of the potash deposits of Stassfurt and Alsace gave her the leading position in the fine-chemical industries, and particularly in the manufacture of dyes. Outside Berlin the chief dyeing centres lie in the basin of the Rhine, at Ludwigshafen, Frankfort, and Leverkusen (Cologne).

Cheap power is also used for the conversion of bauxite—imported from France, Istria, and Dalmatia—into aluminium, which is slowly displacing copper. The aluminium industry grew up in the lignite areas during the War, but recently the tendency has been for the industries to migrate to hydro-electric centres, where power is cheaper. The chief centres of aluminium manufacture are the Erstwerke, Innwerke, and Rheinfelden stations, where the power costs less than one-quarter of that of the sole remaining lignite-power aluminium-works, at Bitterfeld.

Europe needs a unified and protected home market, but as there is not the faintest hope that the customs frontiers will soon be removed by political and diplomatic negotiation the great European industries have taken steps to develop international federations and price-fixing associations. The steel industries of Belgium, France, Germany, and Luxemburg have come to an agreement about production and export, the potash and chemical industries have fused, and there are other industries which are trying to reorganize themselves on a European basis. The War has destroyed many age-old prejudices, and the remarkable development of motor and air transport, wireless telegraphy, and the cinema tend to bring into existence an international understanding in Western Europe. European economic federation

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may be a future possibility, and may pave the way for political union as the United States of Europe. In such a federation Germany will be one of the greatest members, if not the greatest.

THE YOUTH MOVEMENT

Until 1918 the training of the German citizen was of a military character, and national pride in a magnificent army fostered a militarist spirit, which permeated all classes. The terrible years of privation during and after the World War created a new outlook, which expresses itself in what is known as the Youth Movement.

The Germany army has been disbanded, and large numbers of the people spend their leisure in tramping through the countryside. Non-militarist in character, this healthy occupation has done much to restore the mental and physical health of the German nation, and the thousands of youth hostels, where bed and breakfast can be obtained for a shilling (one mark), are now in receipt of State support. Foreigners are eligible for membership on payment of five marks, and each year increasing numbers of English people of all classes make their way on foot through the more picturesque parts of Germany. As this type of foreign travel is cheap, there is no doubt that the result will be to improve greatly international understanding and goodwill.

GERMANY'S FRONTIERS

The Polish Frontier

Unlike the older and partially Latinized countries of the West, Eastern Germany occupies a borderland of religion and speech where a racial conflict has been carried on for many centuries. In fact, the old aggressive national spirit was largely the outcome of Germany's struggles in Prussia and on the Baltic coast. When Prussia annexed Poland the Polish serf had no national consciousness. As a consequence of German rule material progress was much more rapid than was possible in the other provinces of Poland. By the middle

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of the nineteenth century an educated Polish middle class had come into existence in Prussian Poland, and Polish national consciousness awoke as a direct result of the prohibition of Polish speech and the compulsory expropriation of a few Polish estates. The attempt to replace Polish by German farmers failed to establish a bulwark against the Poles,

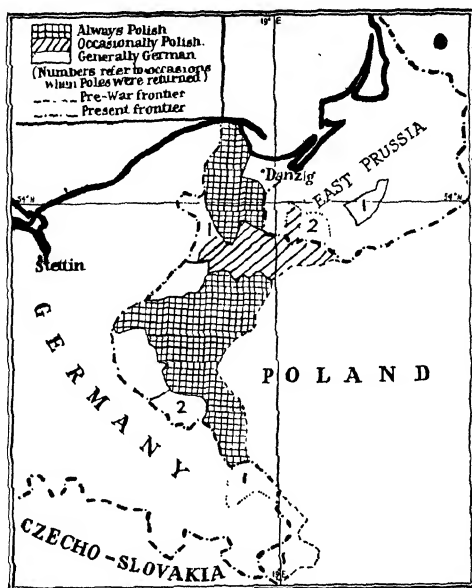


FIG. 60. REPRESENTATION OF THE CORRIDOR PROVINCES IN THE PRE-WAR REICHSTAG

and early in the present century it became evident that the founding of German colonies in Poland had failed to give Germany a numerical majority in the Polish provinces.

Everywhere the Polish labourer is willing to work under conditions which tend to lower the standard of living in Western Europe, and as the Poles were very prolific they increased in number more rapidly than the Germans. This was the case even in Upper Silesia, where the Poles filled the lower-paid occupations, both in the towns and in the rural districts. The purchase of land by the Poles in the

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Prussian provinces was continuous, and a number of seats in the Reichstag were held by Poles from West Prussia.

The anti-Polish measures of the German Government, designed to check the growing emigration of Germans from the frontier provinces, failed, and the migration of Germans from West Prussia to other parts of Germany where living conditions were more attractive was continuous. Large numbers of Germans from Poland settled in Berlin.

Worked by cheap Polish labour, the German farms in West Prussia were an economic success, and the output of grain was enormous. Since the close of the World War Poland has expropriated 640,000 acres of German property in the corridor provinces, and nearly a million Germans have been induced to leave Poland, a migration of the German peoples which has no counterpart in modern European history.

The justice of the establishment of the Polish corridor cannot be discussed here, but the political and economic consequences of its creation should be noted. It is true that Poland needs access to the sea, but it is equally true that Germany needs access to East Prussia and also to Russia. In the Middle Ages the great commercial routes were along the large rivers, but toward the end of the nineteenth century the principal trade-routes of the European plain were from east to west, and a number of important railways were constructed to carry the great transit traffic between Russia and Western Europe. The resumption of this trade is of importance to all the Baltic countries. The existence of the Polish corridor and of the tariff frontiers to which it has given rise has done much to alter the character of the economic life of Eastern Germany and Poland, but the most serious result is the burning hostility between Germans and Poles. Until the eastern frontiers of Germany have been made acceptable to the German nation there can be no hope of permanent peace, and the work of the League of Nations will be hampered. The Germans regard the Poles as inferiors and the Polish occupation of the 'lost' provinces as of a temporary character. The Poles are irritated by Germany's refusal to recognize their country as a great nation, with the

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result that those close commercial relationships between neighbouring states which are the greatest safeguard of international peace have not been fully re-established.

The Western Frontier

It is interesting to compare Germany's attitude toward the loss of Alsace-Lorraine with that adopted in the case of the Polish provinces. Alsace-Lorraine belonged to the Holy Roman Empire of Charlemagne, and was not annexed to France until the seventeenth and eighteenth centuries. It was retaken by the Germans in 1870, and restored to France in 1918. The people of the Franco-German border are of German speech, and though generally well disposed toward France have definite views which are neither pro-German nor pro-French. Many of them would be content to live in an independent Rhine state. Germany definitely renounced all claim to these provinces in the Peace Treaty, and her leaders have repeatedly stated that this renunciation is final.

COMMUNICATIONS AND TRADE

Germany's economic life depends largely on her minerals. Coal is found in the Ruhr district, in Upper and Lower Silesia, and in Saxony, and though at the present time the Saar coalfield is being worked for the benefit of France the output of coal has increased from 140,000,000 tons in 1913 to 151,000,000 tons in 1928, while that of lignite, which occurs over large areas of Central Germany, has increased from 87,000,000 tons to 165,000,000 tons. It is estimated that Germany's productive capacity is now one-fifth greater than immediately before the World War. Remarkable progress has been made in the use of electricity, and between 1925 and 1927 the output of electrical power increased by 25 per cent.

But although Germany's ability to manufacture has been so largely increased the demands of the home market have fallen to 70 per cent. of the pre-War average. Moreover, in consequence of the loss of territory, the confiscation of

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property abroad, the seizure of the merchant fleet, the surrender of railway material and livestock to the victor States, the French occupation of the Ruhr, and the system of reparations, Germany's pre-War national wealth has been reduced by half. As her indebtedness under the Young and Dawes Plans amounts to nearly £5,800,000,000, it may be necessary for Germany to increase her export trade to such

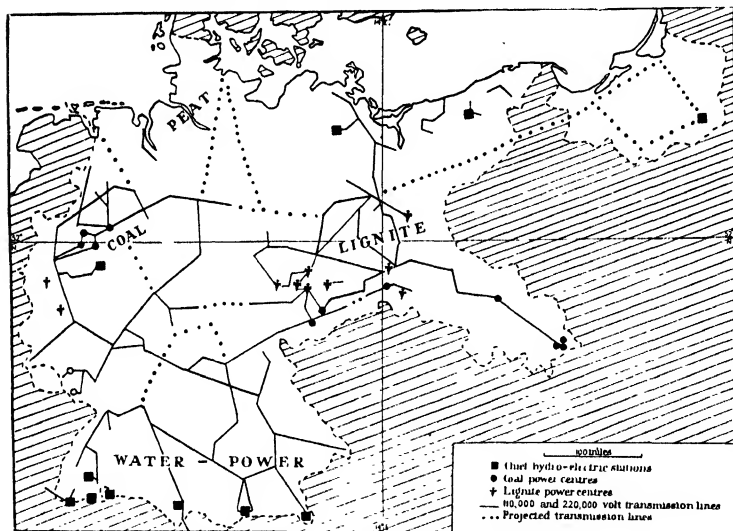


FIG. 61. SKETCH MAP OF THE DISTRIBUTION OF ELECTRICAL POWER IN GERMANY IN 1929

Electrical power developed in 1913, 1,300,000 h.p.; in 1929, 5,200,000 h.p. The latter figure comprises hydro-electric power, 1,100,000 h.p.; coal power, 1,400,000 h.p. (Westphalia 850,000 h.p., Upper Silesia 220,000 h.p.); and lignite power, 2,700,000 h.p.

an extent that she will become the most intensively industrialized country in the world.

The extent to which German trade has already recovered since the War may be judged from the fact that in 1928 her railways carried 480,000,000 tons of freight and her inland waterways 155,000,000 tons, amounts comparable with those of 1913 (railways 500,000,000 tons and waterways 100,000,000 tons). In the case of water-borne traffic, the amount of foreign trade has increased from 43,000,000 tons in 1913 to

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56,000,000 tons in 1928. Moreover, the quantity of goods exported by rail at the present time is about 24,500,000 tons. These figures indicate that, despite the taxation per head being now three times as great as in 1913, very remarkable progress has been made.

Up to the present, however, it has been impossible to balance exports and imports, and each year the volume of imports is two and a half times as great as that of the exports. To a certain extent the lack of balance between import and export cargoes may be explained by Germany's need of bulk cargoes of foodstuffs and raw materials, whereas more than two-thirds of Germany's exports consists of relatively light manufactured articles, which are often sufficiently valuable to stand the cost of railway transport to other countries. From the Rhine provinces German machinery, cloth, and fertilizers are carried to France and Belgium. Coal and grain are sent up the Rhine valley to Switzerland and Italy, while petroleum, rice, cotton, jute, and chemicals cross the frontiers of Austria and Czecho-Slovakia.

GERMANY'S FOREIGN TRADE IN 1928
(IN MILLIONS OF POUNDS)

	Imports	Exports
Livestock . . .	72·6	·9
Foodstuffs . . .	210·1	31·5
Raw materials . . .	362·2	135·2
Finished goods . . .	122·9	435·0
	<hr/>	<hr/>
Total . . .	702·5	602·2

Fourteen per cent. of the value of the exports is obtained from iron and steel goods, 10 per cent. from machinery and electrical apparatus, and 6 per cent. from paper and woollens. There is normally an exportable surplus of about 35,000,000 tons of coal, but as 14,000,000 tons are needed for reparations payments there is relatively less for export to Central European markets, which are now supplied by Poland.

Since the World War Germany has had an adverse trade balance, and it is impossible to state precisely in what direction the German export trade will develop when stable conditions return. In the past Germany succeeded in developing

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her industries harmoniously, and constant attention is still being paid to the improvement of her means of communication. Her industrial success is due in a large measure to the cheapness of her inland waterways and railways. At the present time, however, her railways are in pawn as security for the payment of her debts, and railway freights have risen. Fortunately for Germany, the canals are still available for the transport of bulky non-perishable cargoes, such as cotton, ores, metals, coal, timber, petroleum, and grain, if railway rates rise too much. Before 1914 goods were carried on the German waterways at less than one-tenth of a penny per ton-mile, and during the period when the rivers are free from ice cheap freights are still maintained.

It should be noted that with the exception of Hamburg and Stettin Germany's greatest industrial centres lie far inland, and thus create an internal trade much greater than that which is carried on with foreign countries. The main traffic-routes are the great valleys, but with the possible exception of Duisburg more than half the inland traffic of the great German ports is carried by rail. The existence of the inland waterways ensures cheap freights, but even then more than half of the bulk cargoes carried by inland shipping is afterward transhipped to the railways, and there is close co-operation between the railways and the waterways (*cf.* Britain). The chief items of Germany's internal trade are coal and lignite, which form 37 per cent. of the total traffic. Iron, steel, fertilizers, and timber are generally carried by rail, but two-thirds of the traffic in mineral ores is carried by barges. The greatest railway traffic centres are Essen (148,000,000 tons in 1928), Cologne (58,000,000 tons), Halle (53,000,000 tons), Elberfeld (44,000,000 tons), Hanover (33,000,000 tons), and Breslau (31,000,000 tons), but a large proportion of the rail-borne goods of these centres is transit traffic, and the principal terminus is Berlin, where more than 4,000,000 people form the greatest single market of Continental Europe. Of the 11,000,000 tons of cargo brought by water up the Spree valley more than half is handled at the quays of Berlin, the return cargoes consisting chiefly of timber from the neighbouring forests.

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If the proposed canal between Magdeburg and Hanover, the eastern terminus of the Midland Canal, is completed the Weser basin will be able to develop industries on the scale of the Rhine and the Elbe. Already the section between Rheine and Hanover carries annually about 2,000,000 tons of goods, and this amount would be greatly increased if through connexions could be established between the Rhine and the Elbe. It is to the railways, however, that Germany owes her great internal commerce, and Bremen, the lowest bridge-town of the Weser, depends almost entirely on the railways for connexion with its hinterland. This port imports grain and timber for the Weser valley and cotton for the mills of Northern Westphalia and Saxony. Its export trade consists of metal goods and fertilizers, but it is also an important passenger port for North America. Before the World War Germany's Baltic ports were important for railway transit trade from the East, but the creation of the Polish Republic has cut them off from the Russian market. Königsberg has suffered most, because the Niemen has been closed for the rafting of timber from Poland and Russia. The coal of Upper Silesia no longer passes in large quantities through Stettin, but through Danzig and the Polish port of Gdynia.

Nearly half of Germany's overseas trade is handled by two ports, Hamburg, with Altona and Harburg, and Duisburg-Ruhrort. Hamburg receives about 16,000,000 tons of food-stuffs and raw materials for all parts of Germany. It is an *entrepôt* as well as a transit port, and of the 9,000,000 tons of goods exported a considerable proportion consists of mixed cargoes for every part of the world. Duisburg-Ruhrort, on the other hand, is a highly specialized port, receiving between five and six million tons of iron ore, grain, and timber either direct from overseas or from the transit port of Rotterdam, to which it sends more than 13,000,000 tons of coal each year.

Imports are received from every part of the world, but more than one-third of the imports comes from the other countries of Western Europe and from Italy. One-fifth is obtained from Britain and Dutch colonial possessions, and one-sixth from the United States. More than half of

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Germany's exports go to European countries, and especially to Britain and Holland, which take one-quarter of the total exports. The only other important export market is the United States, which takes less than one-twelfth of the total.

PHYSICAL REGIONS

Germany consists of a number of (*a*) uplands and highlands in the south and (*b*) continuous lowlands in the north, stretching from east to west and meeting the Baltic and North Seas. The German uplands may be subdivided into (i) the north central uplands, which lie to the north of the basin of the Main and consist of a Triassic plateau interrupted by the igneous intrusions of the Rhön and Vogelsberg and by the Primary highlands of Thuringia and the Harz; (ii) the South German highlands, which include the Alps and Alpine Foreland of Southern Bavaria and the Swabian and Franconian Jura; (iii) the uplands of the Rhine basin, comprising the old earth-block of the Black Forest and Odenwald, the Triassic plateaux of the Palatinate, Saar, and Northern Bavaria, enclosing the isolated plain of the Rhine Rift Valley and the Rhine plateau; and (iv) the eastern highlands—the Erzgebirge, Sudetes, and Riesengebirge—which merge into the upland plain of Upper Silesia.

The German lowlands are of fairly low general relief, but may be subdivided, according to the nature of the surface, into (i) the southern terraces of morainic material, containing many areas of sand and loess in the Westphalian and Silesian plains, and on the Bourtanger, Lüneburg, Fläming, and Lausitz moorlands and heaths; (ii) the great valleys of the Oder, Elbe, Weser, and Ems, whose alluvial soils produce rich crops when they are drained; (iii) the Baltic ridges of Holstein, Mecklenburg, Pomerania, and East Prussia; and (iv) the low sandy coast-lands of the Baltic plain.

There is no typical German climate, and the northern plain exhibits a gradual transition between the maritime conditions of the North Sea and the continental conditions of Poland and Russia. In the south the alternation of bleak mountains and sheltered valleys gives a number of local

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climates which vary according to exposure to winds and sunshine.

The economic sub-regions of Germany correspond fairly closely to the physical divisions. The South German uplands contain a number of more or less distinct economic districts, but there is a considerable difference between the general character of the highlands and that of the northern plain.

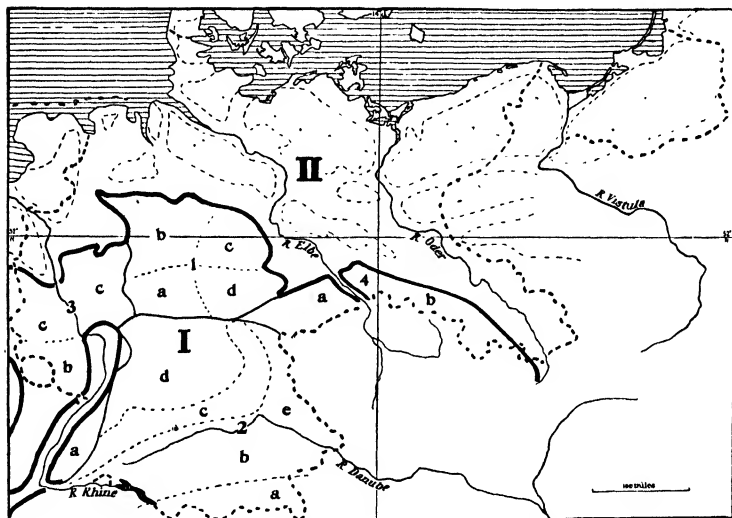


FIG. 62. PHYSICAL REGIONS OF GERMANY

- I. **Highlands:** 1, north central uplands: *a*, Hessian upland; *b*, Weser hill country; *c*, Harz; *d*, Thüringer Wald. 2, southern uplands: *a*, Alps; *b*, Alpine Foreland; *c*, Jurassic scarpland; *d*, Triassic plateau; *e*, Bavarian forest. 3, Rhine uplands: *a*, Black Forest; *b*, Harzt; *c*, Rhine massif. 4, eastern uplands: *a*, Erzgebirge; *b*, Sudetes and Riesengebirge.

- II. **Lowlands.** Moorland soils dotted; alluvium and loess unshaded.

Until recently diversified conditions and restricted ease of communication tended to promote disunity among the people. This is evidenced by the existence of many small states, which were consolidated as a united empire, and since 1918 as a republic, only under the stress of economic needs. The upland areas resemble other upland districts of Central Europe in being unsuited to the large-scale growing of wheat or maize. They consist of large areas of forest, moorland,

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and rough pasture, with here and there small patches of fertile soil cultivated in small holdings. There is hardly any upland district where useful minerals cannot be found, though coal is mined only at the edges of the Primary plateaux. Like other mountainous regions, the German highlands support a fairly constant population engaged in pastoral and forest occupations, and any considerable addition to their numbers can be maintained only by manufacturing. In the past there has been a good deal of emigration from these uplands, and this has sometimes taken the form of the establishment of troops of mercenary soldiers, such as the Hessians, for service with foreign Powers. At the present time the rapid development of hydro-electric power throughout South Germany tends to check emigration and to promote a greater degree of specialization in manufacturing.

CHAPTER XVII

GERMANY: THE GERMAN HIGHLANDS

I. THE NORTH CENTRAL UPLANDS

THE north central highlands lie between Münsterland, the watershed of the Ems and Lippe rivers, and the Saale, a tributary of the Elbe. On the south the region is bounded by the basin of the river Main, but includes both Thuringia and Hesse, as well as the chalk country of the Teutoburger Wald. The greater part of the area is a northerly continuation of the Triassic plateau of the Main basin, but in many parts the Triassic covering has been eroded, exposing older Primary rocks in the Weser Bergland and the Harz Mountains, while certain Tertiary igneous rocks appear as peaks in the Vogelsberg, Rhön, Halichtswald, and Meissner, the southern heights of the Hessian district. In the south-east the Thüringer Wald consists of Primary rocks surrounding a core of igneous rocks. Frequently these eruptive areas contain deposits of lignite, which form the basis of small local industries. The Triassic rocks continue as far as Osnabrück, in the north-west, and almost to the town of Halle, in the north-east. On the extreme north of the Harz, in the neighbourhood of Brunswick and Hanover, the Triassic rocks disappear beneath Jurassic and chalk deposits, which in turn dip below the Tertiary and Quaternary soils of the North German and North Sea plains.

Climate, Vegetation, and Agriculture

The average annual temperature of the plateau seldom exceeds 45° F., while in the higher parts the mean temperature is below 42° F. Practically the whole of the region has more than a month's continuous frost in winter, though the upper parts of the Saale valley have more than two months

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of frost. The summers are cool, and the July temperature seldom averages 65° F. As a result, wheat ripens with difficulty, except in Münsterland, in the north of the Weser Bergland, and in the east and south-east of the Harz, where the summers are generally somewhat warmer and more sunny.

In the Weser Bergland, the Hessian uplands, the Harz, and Thuringia the annual rainfall is generally more than thirty-five inches, though to the west of the Saale, in the rain-shadow of Thuringia and the Harz, the rainfall is as low as twenty-two inches, so that both sugar-beet and vines ripen. Throughout the greater part of the plateau there is sufficient precipitation for the growth of forests—*e.g.*, 40 per cent. of the Hessian Bergland consists of forest and moor. As the summer temperature is generally too low for wheat, sugar-beet, and vines, the principal crops of the valleys are potatoes, oats, and rye, though where the local climate is favourable the Keuper marls produce flax, hemp, tobacco, and fruits. The higher parts and hill slopes are covered with forest, grassland, or moor, the heath being particularly noticeable where the surface consists of crystalline rocks. The surfaces of the plateaux are pasture-lands, and the hill slopes are wooded. The principal agricultural industry is cattle-raising, though pigs are fattened in the grain districts, sheep being important only on the moors and waste lands.

Mineral Wealth

Lignite is found to the south-west of Halle, on the Saale, and is chiefly used in that district for the manufacture of briquettes. It should be noted that Germany produces about four-fifths of the world's output of patent fuel. This is largely due to the lignite of Saxony containing materials which assist in binding. The German output of patent fuel is more than 35,000,000 tons, and as a result of the conversion of lignite into briquettes it is possible for the lignite areas to develop manufactures, even those which require a large fuel consumption. Halle and Bonn together produce about 80 per cent. of the German output of brown coal, and lignite

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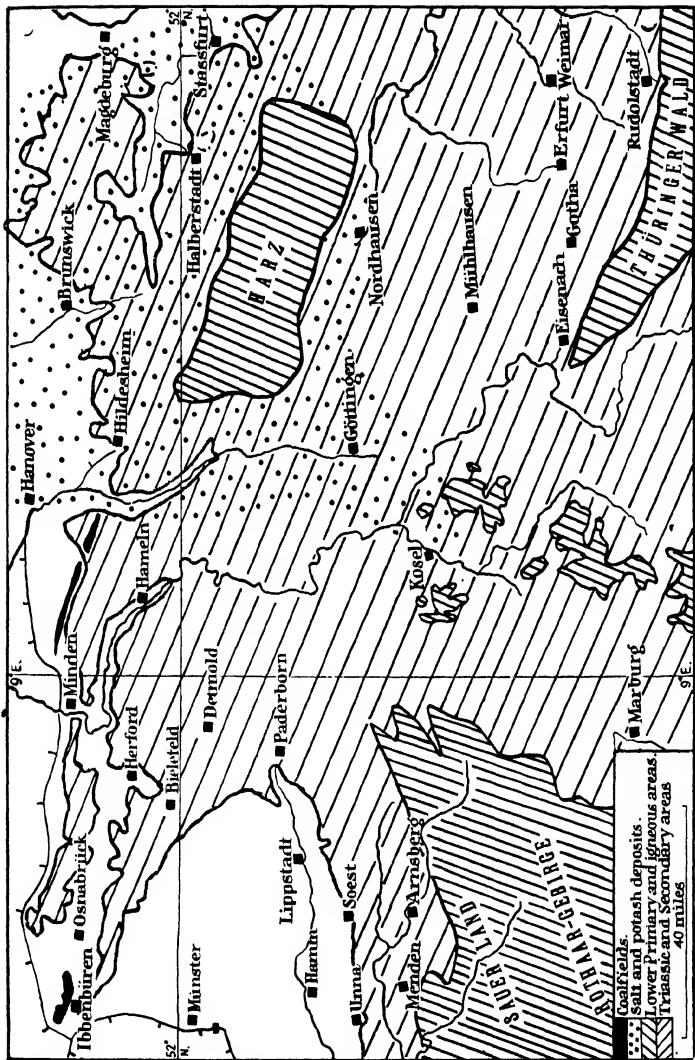


FIG. 63. SKETCH MAP OF THE NORTH CENTRAL UPLANDS OF GERMANY

All land above 600 feet is shaded. Name the rivers.

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is also found near the source of the Aller (Brunswick brown coalfield), on the west of Magdeburg, in the Unstrut valley (Thuringia lignite district), on the west bank of the Weser, north of Cassel, and in the Hesse lignite districts, in the neighbourhood of Laubach and Meissner.

Coal is found in three parts of the north central uplands. The Ruhr coalfield produces about two-thirds of Germany's total output, but will be dealt with more fully elsewhere. The Osnabrück coalfield lies to the west and north of Osnabrück, the chief mining centres being near Ibbenbüren, Uffeln, and Piesberg. The output is very small, and is used locally. The Diester or Minden-Hanover coalfield lies to the south-west of Hanover. The output is very small, and is used to supplement that of the Brunswick-Magdeburg coalfield. Throughout the north central uplands, with the exception of the Ruhr coalfield, which lies near its borders, the production of coal is unimportant.

Iron ore is one of the chief minerals derived from the north central uplands, which now form the chief iron-mining region of Germany. The ore of Siegerland is chiefly directed to the Ruhr industrial district, but there are also local furnaces which produce more than half a million tons of pig-iron and more than a quarter of a million tons of steel annually. The Hessian-Nassau ironfield lies in the Lahn valley and in the Vogelsberg, near Wetzlar. Manganiferous iron ore is mined at Giessen, the total output of ferro-alloys in Siegerland and Hesse-Nassau being about 36,000 tons per annum. The Weser Bergland contains iron-mines near Minden and Herford. In Thuringia iron ore is found near Rudolstadt, on the Saale, and at Eisenach, in the Werra valley. In the Harz iron ore is found and the pyrites is used for the manufacture of sulphuric acid at Nordhausen. There are old iron-mines in the neighbourhood of Ibbenbüren, in the Teutoburger Wald, and at Meggen, in the Lenne valley, which drains into the Ruhr, there are important pyrites-mines, producing about 5 per cent. of the world's output.

Non-ferrous minerals occur in many districts, copper having been mined for centuries at Mansfeld, on the east of the Harz, silver and lead at Rummelsburg, in the Harz, and also

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on the east of the Rhine, in the upper parts of the Ruhr, Wupper, and Lahn basins. Silver and lead are also produced as by-products in the Mansfeld mines. Zinc is still mined in the Harz, to the south of Brunswick, and in the basin of the Ruhr. The metal-mines of the north central uplands have lost their importance since the development of the mines of America, Africa, and Australia, but they have left behind a traditional skill in metal-working which accounts for the important metallurgical, mechanical, and toy industries which are found on the fringes of the plateaux.

The world's chief potash-producing area lies in the Triassic rocks to the west of the lower Saale, and especially in the Bode valley, where the town of Stassfurt is the chief centre. Until the beginning of the present century the Stassfurt district was the only area producing potassium salts on a large scale, but with the loss of Alsace Germany's world-monopoly in potash salts has been broken. The salt and metal industries have given rise to important chemical industries—*e.g.*, Nordhausen sulphuric acid, etc.

‘ Inland Waterways and Route Centres

The highland separates the fertile southern portion of the North German plain from the lowlands of the Rhine and North Sea coasts. As the valleys entering the Saale and Weser give through communication between the Rhine valley and the lowlands of Saxony, there are many beautiful castle-crowned gorges which were important during the Middle Ages for their command of routes across the uplands. Such towns as Cassel, Porta Westfalica, Osnabrück, Gera, Halberstadt, Brunswick, and Hanover owed their medieval importance to their control of routes. Paderborn, Nordhausen, Hildesheim, Bad Hersfeld, Fulda, Naumburg, and Erfurt controlled lesser routes and owed much to ecclesiastical or Imperial patronage—*e.g.*, Saalfeld was a castle and monastic centre and possessed a mint.

Throughout the medieval period the rivers were used for purposes of navigation, and the distances which had to be traversed across the plateau by land were really quite short.

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The limits of small-boat navigation are given in the following table:

Aller.	.	.	Brunswick, on the Oker Hanover, on the Leine
Ems.	.	.	Münster, on a tributary, the Aa
Gera.	.	.	Erfurt
Lahn	.	.	Giessen
Lippe	.	.	Lippstadt
Ruhr	.	.	Witten
Sieg.	.	.	Henner
Unstrut	.	.	Heldrungen, north-west of Naumburg, the present limit of navigation on the Saale
Weser	.	.	Eschwege, on the Werra

The valleys through which the overland journeys converged possessed important nodal towns which developed from military and ecclesiastical centres into important commercial towns—*e.g.*, Erfurt, Rudolstadt, Göttingen, Paderborn, Detmold, Marburg, Cassel, Fulda, and Meiningen. With the development of railways the towns at the limits of boat navigation declined, while those points where railway routes converged became important commercial and manufacturing cities. Thus Cassel (see page 304) marks an important junction of trunk-routes from Hanover, the Ruhr, Berlin, and Frankfort; Münster (107,000 inhabitants), an old castle-town, is a railway junction for routes between the Rhine and the North Sea ports, with considerable transit traffic with Holland. Halberstadt (49,000 inhabitants), an important commercial centre in the thirteenth, fourteenth, and fifteenth centuries.

The east-west route round the north of the central uplands has given rise to very important towns at the points where the Leine, Oker, and Weser break through the highlands into the northern plain. The convergence of east-west and north-south routes has created important cities at Brunswick, Magdeburg, and Hanover. The Midland Canal system follows the same route as the roads and railways, Rhein-station being connected with Münster, on the Ems Canal, and Reisenbeck, at the junction of the Dortmund-Ems and Midland canals. There is a branch to Osnabrück. Minden is

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the limit of steamboat navigation on the Weser, and possesses harbours for cargo-boats. It is connected by the eastern section of the Midland Canal to Hanover and Hildesheim, and it is proposed to continue the canal to Brunswick, Magdeburg, Halle, and Leipzig.

Sub-regions of the North German Uplands

Münsterland

Münsterland is the undulating transitional country which lies between the Ems and the Lippe rivers at a height of between 100 and 800 feet above sea-level. The greater part of the area consists of chalk, covered on the north of the upper Ems by glacial drift and alluvium. The chalk is used in the cement industry of Coesfeld and Beckum, but the chief industry of Münsterland is agriculture, and as the country is fertile large crops of wheat and other grains are grown. The rearing of pigs is important in the grain districts, and sugar-beet is extensively cultivated. Borken (6000 inhabitants), near the Dutch border, is an ancient fortress with important horse, cattle, and pig farms. It manufactures textiles (*cf.* Eastern Holland). Tobacco is grown round Ahaus, while locally grown flax and wool obtained from the chalk pastures gave rise at an early date to the manufacture of linen and woollen goods. The opening up of the Ruhr coalfield led to the introduction of industrial machinery, and the manufacture of cotton is widespread. Bocholt (31,000 inhabitants) lies near the Dutch frontier, and is the great cotton-manufacturing centre of Westphalia, with seventy spinning- and weaving-mills. It is also the northern outpost of the Rhenish-Westphalian iron industry. Rheine (15,600 inhabitants), the present limit of river navigation on the Ems, is an important railway centre connecting the North German plain and the Rhenish-Westphalian industrial district. It also possesses cotton-spinning and weaving industries. The only place where coal is produced in Münsterland is Ahlen (23,000 inhabitants), which lies to the north of the Lippe, near Hamm. It has a number of small industries

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intermediate in character between those of the coalfield and those of the pastoral district which lies to the north—*e.g.*, coke, boot and shoe machinery, and sausages. Lippstadt (18,600 inhabitants), at the head of the Lippe river, commands the approach to the Paderborn gap, in the Teutoburger Wald. It is in a cattle district and is the junction market of Münsterland, the Ruhr, and the north central uplands. It is the grocery centre of the western part of the uplands, and specializes in the manufacture of rye-bread, "pumpernickel." Its industries include tobacco, beer, spirits, soap, wire tacks, bricks, ropes, motor-cars, bicycles, and carriage lamps.

Paderborn (33,000 inhabitants) commands the Lippe route to the Weser hill country. An ancient bishopric, it is a market for corn, potatoes, and cattle, and possesses dyeing, printing, and lime works. Bielefeld (86,000 inhabitants), on the north of a gap in the Teutoburger Wald, commands the main railway route from the Ruhr to Minden and Hanover. Locally grown flax early gave rise to linen spinning and weaving. It also manufactures bicycles and sewing-machines. Münster (106,000 inhabitants), on the Dortmund-Ems Canal, has railway communications with Osnabrück, Bremen, the Ruhr, and the border towns of Wesel, Emmerich, Bocholt, Enschede, and Oldenzaal. It is the junction market of the arable and pastoral areas of Münsterland, with leather, beer, and textile manufactures—*e.g.*, canvas.

Münsterland is slowly emerging from a purely agricultural condition by the development of subsidiary industries which are fostered by the cheapness of power obtained from the Ruhr coalfield. With the opening up of new coal-mines to the north of the Lippe it is probable that a considerable part of Münsterland will be absorbed within the Rhenish-Westphalian industrial region.

The Weser Hill Country

(a) *The Hesse Uplands.* The headstreams of the Weser (the Fulda, Schwalm, Eder, and Werra) rise in the igneous

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highlands of the Rhön, Vogelsberg, Rothaar-Gebirge, and Thüringer Wald, all of which are poor pastoral districts, which have never been able to support dense populations. Many of the mountain folk were in former times compelled to leave the district in search of employment as mercenary soldiers in Holland, Britain, and Hanover. At the present time the tendency is for manufactures to develop because of the nearness of the Ruhr and Saxon coalfields.

The upper Fulda is a scantily populated pastoral district, Fulda (27,000 inhabitants) being the head of boat navigation and the site of a medieval bishopric (*cf.* Münden). Bad Hersfeld (11,000 inhabitants) is the limit of barge navigation at the junction of the Haune and Fulda rivers. It was an eighth-century monastery, and at the present day has developed textile, machinery, and leather industries. The Schwalm river rises into the Vogelsberg, a granite hill mass clothed with moors and forests. This district forms an important centre of winter sports. It is drained on the west by the Lahn, Marburg (23,000 inhabitants) being the market town for the oats and potatoes of the upper Lahn, a university centre and health resort. Giessen (33,000 inhabitants), commanding the gorge and at the head of barge navigation, is the centre for manganese-iron ore mining, and Wetzlar (18,000 inhabitants) has iron-mines and blast-furnaces and manufactures scientific and optical instruments, chemicals, and cigars.

The Eder river rises in the moors of the Rothaar-Gebirge and contains the Talsperre Lake, a reservoir nearly twenty miles long. It is a district which possesses bath and mineral springs—*e.g.*, Bad Wildungen—but is very scantily populated. The Werra river, which rises in the Thüringer Wald, is navigable for small boats from Meiningen and for barges from Eschwege, below Eisenach. Its meanderings have given a greater proportion of fertile soil than is usual in these barren uplands, and considerable quantities of grain and potatoes are grown. Towns have grown up at Meiningen (20,000 inhabitants), which manufactures chemicals and machinery, and at Eisenach (45,000 inhabitants), in the Hörsel valley, which provides an easily accessible route

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through Thuringia to Gotha and Erfurt. An eleventh-century fortress town, Eisenach lies in the neighbourhood of iron-mines and mineral springs and possesses iron, cotton-spinning, and cigarette industries. Eschwege, at the limit of barge navigation, manufactures leather, tobacco, and cloth.

(b) *The Lower Fulda and the Weser Uplands.* The Fulda is navigable for steamboats from Münden. Cassel (171,000 inhabitants) lies in the gap where the Eder, Schwalm, and Fulda routes enter the navigable portion of the Weser valley. A small provincial capital (Hesse) at the beginning of the nineteenth century, its population has increased nearly five-fold since 1864 because of the construction of railways which meet there. Since its inclusion in Prussia in 1866 its political importance has declined, but it is an extremely important local market, and is connected by trunk-routes with Hamburg, Saxony, Frankfort, and Rhenish Westphalia. Cassel possesses local lignite deposits and manufactures chemicals, linen, tobacco, and wooden goods. Its iron industries include the manufacture of aeroplanes and scientific instruments, while its locomotive-works are the largest in Europe. Münden, a small town which has grown up round a fifteenth-century castle, is the limit of steamboat navigation.

Below Münden the Weser enters good agricultural country, which produces grain, potatoes, and sugar-beet. The industries include sugar-refining and flour-milling, as well as the paper and leather industries which characterize the upper parts of the Weser basin. Hameln (27,000 inhabitants) is an important bridge-town with a large barge traffic. At Hausberge the Weser breaks through the ridge of the Wiehen-Weser Gebirge, Porta Westfalica being connected by canal with Minden (30,000 inhabitants), which lies at the junction of the Weser and the Midland Canal. Minden is the market for the grain and potatoes of the neighbourhood, and manufactures tobacco, soap, and glass. The Else and Werre rivers are tributaries of the Weser, and drain the Teutoburger Wald. The local power resources led to the development of textile and iron industries at Osnabrück, Bielefeld, and Herford, but at the present time it is necessary to import both

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raw materials and coal from other districts by means of the Midland Canal to supplement the local output of iron ore and coal. Even the flax, which was formerly grown in sufficient quantities locally, is now largely obtained from abroad. Ibbenbüren is the chief mining centre, and there are deposits of iron ore in the same district. Osnabrück (92,000 inhabitants), at the junction of the Dortmund-Ems and Rheine-Leine (Midland) Canals with the Hase river (in the Ems basin), is an important iron-manufacturing town and produces agricultural machinery, sewing-machines, wire goods, and copper-ware. Paper is also manufactured, and the town is the chief general market of the Teutoburger Wald. Bielefeld has already been mentioned as sharing the textile and metal industries of the Else and Werre valleys. Herford (37,000 inhabitants), on the Werre river, is important for the spinning, weaving, and bleaching of linen, and manufactures *lingerie*, furniture, margarine, sugar, tobacco, beer, and spirits (*cf.* Detmold, which has chemical and cattle-cake industries).

The Leine river rises in the Eichsfeld, which lies to the south of the Harz, and flows through fertile country. Göttingen (41,000 inhabitants) is the chief market of the tobacco- and corn-growing district of the Mulde and possesses ironworks, its special manufacture being the construction of scientific instruments, an industry which owes much to the local university. Below Göttingen the Leine valley narrows and passes through the Hils upland into the North German plain, becoming navigable at Hanover. Hanover-Linden (425,000 inhabitants), at the head of Leine navigation, is one of the greatest railway centres in Europe, and is connected by the Midland Canal with the Ems and the Rhine. The tonnage dealt with in 1922 was about 850,000, more than half of which passes through Linden, on the west of the river. To the south-west of Hanover lies the Diester coalfield, which supplies fuel for the machinery, gas-engine, locomotive, chemical, chocolate, and furniture industries. The lower Leine possesses potash deposits used in the chemical industry. Hildesheim (58,000 inhabitants), on the Innerste river, was one of the earliest bishoprics of Germany,

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and became a Hanseatic and Imperial city with an important bronze manufacture. It is an important railway junction and the present terminus of the Midland Canal, and is engaged in the potash industry.

The Harz

The Harz group is an ancient plateau of Devonian and Silurian rocks through which intrusive igneous rocks have penetrated. Its general elevation is between 1000 and 3500 feet above sea-level. Its climate is severe, the winters being very cold, especially at night, and snow frequently covers the timber of the upper slopes. As a result, winter sports have developed in the Andreasberg district. There is little cultivation, except in the valley bottoms, and the potato is practically the only crop grown in the forested districts. The upper Harz, in the north-west, includes the Brocken, and rises to nearly 3500 feet, the mountain slopes being clothed with pine-woods. The lower Harz, in the south-east, occupies two-thirds of the whole area, and is covered with mixed woods, forests occupying four-fifths of the area, so that no coal is needed as fuel.

The upper Harz is a district of important summer and winter resorts, Goslar (21,000 inhabitants) being a tourist and hydro centre with important copper- and lead-mines. In earlier times the Harz was chiefly famous for its mineral wealth, and many mines are still worked for zinc, copper, iron, lead, and silver. Ores containing silver, lead, and copper are still worked at Clausthal, Zellerfeld, Sankt, Andreasberg, Lautenthal, Abtenau, Wildmann, and Grund. The chief forest industries are lumbering and the making of bobbins for hosiery manufacture. Canaries are bred at Wernigerode (18,000 inhabitants).

The lower Harz is drained by the Bode river on the east and possesses mountain resort and mining industries, though these are not very important. At Quedlingburg (27,000 inhabitants), where the Bode enters the plain of the Saale, there are railway connexions with Magdeburg and Berlin which afford an outlet for the produce of the local nursery

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garden and seed industry. Halberstadt (49,000 inhabitants), on the Holtemme river, is the chief railway junction serving the Eastern Harz, and was formerly important for timber industries. The Wipper river drains the eastern extremity of the Harz uplands and passes through the important copper-mining and smelting district of Eisleben (24,000 inhabitants) and Mansfeld. Aschersleben (28,000 inhabitants) is the market town at the point where the Wipper enters the Saale plain, the local lignite and potash mines supporting an important chemical industry. Malt, sugar, beer, and agricultural machinery are also manufactured.

The lower Bode and Wipper flow through rich agricultural land underlaid by the most important potash-field in the world. The surface soils produce fruits, grains, and sugar-beet, while the subsoils provide rock-salt and potash at Stassfurt (28,000 inhabitants) and Schönebeck (20,000 inhabitants), where materials for chemical industries are produced.

The Southern Harz is drained by the Helme, Aue, and Wipper tributaries of the Unstrut, which eventually flows into the Saale. Nordhausen (35,000 inhabitants) owed its former importance as an Imperial city to its command of the route leading to the Weser, but its present industries are based on the lignite of the Halle district and the water-power derived from a reservoir in the Ilfelden valley.

The Oker flows through the hill country which lies to the north of the Harz into the fertile valley of the Aller, which produces large crops of grain and sugar-beet. Brunswick (147,000 inhabitants) is the principal market for the corn, sugar, vegetables, and cattle of the upper part of the Aller basin. It owed its medieval importance to its command of the land-route from Lübeck and Hamburg to South Germany. During the Middle Ages the Lüneburg Heath provided the only practicable route from Hamburg to the upland regions of Southern Germany on account of the marshy nature of a great part of the North German plain. This route attained its greatest importance during the fourteenth and fifteenth centuries, and even at the beginning of the nineteenth century Brunswick remained an important road centre, though the roads were poor and consisted for the most

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part of sandy tracks into which the heavy coaches often sank to the axles. As it is not on navigable water, Brunswick is less important than Hanover. Nevertheless, its railway connexions enable it to carry on various industries allied with agriculture, such as the manufacture of machinery, sugar, tobacco, preserved meats, woollen and jute goods. It is an important book-printing centre, an industry which owes a great deal to Brunswick's position as the capital of a duchy and a centre of Protestantism.

The Thüringer Wald and the Saale Valley

The Thüringer Wald is a horst of crystalline rocks and conglomerates which break through the Bunter Sandstone and form a region of relatively low relief, the chief peak, Ingelsberg, being only about 3000 feet above sea-level. Forests of pine clothe the slopes and cover more than a quarter of the area of Thuringia and Anhalt. In the valleys are rich meadows. The gentle nature of the valley slopes makes the Thüringer Wald a district where a number of main railway routes converge, and Erfurt is connected by trunk railways with Nordhausen and Hanover, Magdeburg and Hamburg, Nuremberg and Munich, Cassel and Cologne, Würzburg and Stuttgart, Jena and Frankfort, and with Leipzig, while there are also routes through Coburg and Eisenach.

Mining was formerly important, and a small copper-mine is still worked at Ilmenau. Schmalkalden, an old castle-town with brine baths, has developed a modern iron and steel industry, while Zella-Mehlis (16,000 inhabitants) has a number of small iron manufactures (nails, scissors, firearms, tools, motor-cars, and cycles) of the Birmingham type. In the sixteenth century there were numerous forges based on local ore, timber, and water-power, but since the Thirty Years War the iron industry has practically disappeared, largely because there are few navigable waterways. There are, however, several glass-works based on the presence of local granite sands and locally produced charcoal—e.g., at Lauscha and Ruhla. The latter town also manufactures por-

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celain and meerscham pipes. Gotha (48,000 inhabitants) owes its importance to royal patronage, and possesses an important lithographic industry. It is known for its fine map-printing. The forest industries include the manufacture of toys at Hildburghausen and Sonneburg (20,000 inhabitants), though metal is used as well as wood. The south-east of the Thüringer Wald is continued in the Frankenwald, a plateau of gneiss, slate, and greywacke. Here there are small timber industries, while berries and mushrooms are gathered for export. Slate is quarried and glass manufactured, and there is a domestic spinning and weaving industry, embroidery being the chief product.

The Saale Basin

The Unstrut river rises in the Eichsfeld and drains the plain of Central Thuringia. Domestic weaving is still carried on in the Eichsfeld, and the woollen yarns and cloth and the leather of the pastoral districts are marketed in Mühlhausen (35,000 inhabitants), the principal town. The Gera rises in the Thüringer Wald and flows through Keuper marls, which support nursery garden and seed culture. Salt is mined and iron and leather goods are made at Erfurt (136,000 inhabitants), where the river becomes navigable. Erfurt is the site of an ancient bishopric and the military and commercial centre commanding the main routes from Germany to Bavaria and Italy. It owes its modern development to the excellence of its railway communications. The Ilm flows from the highlands in a direction roughly parallel to that of the Gera, Weimar (43,000 inhabitants), the principal town, manufacturing glass and pottery and Apolda (25,000 inhabitants) manufacturing hosiery.

The Saale rises in the Fichtelgebirge and flows through the Frankenwald to the old castle and monastery town of Rudolstadt (16,000 inhabitants), which commands the main railway route from Nuremberg and Bamberg to Halle and Berlin. Rudolstadt uses local resources in its cosmetic and porcelain industries, but imports the raw materials for its chocolate and marmalade manufactures. Saalfeld (18,000

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inhabitants) has machine-works and sawmills and Jena (53,000 inhabitants), which has increased its population four-fold since 1893, owes its rapid increase in prosperity in part to the researches made at its university during the latter part of the nineteenth century. It manufactures optical and refractory glass, iron, and porcelain, using raw materials obtained locally. Naumburg (30,000 inhabitants), at the confluence of the Unstrut and the Saale, is peculiarly favoured in its surroundings. Behind it the forest-clad Bunter Sandstone sinks under the fertile Unstrut and Helme valleys, the region between Nordhausen and Kyffhauser being named the Golden Vale, where excellent orchard country lies on the muschelkalk slopes and fertile fields and meadows in the valleys. The climate is dry and sunny throughout the lower parts of the Saale and Unstrut basins, and wine is produced in small quantities near Naumburg. Below Naumburg, the limit of steamer navigation, the Saale becomes a river which could be used for commercial transport, though it needs a deep canal to Leipzig. Merseburg (27,000 inhabitants) is the chief embroidery centre of the Saale valley, and Halle (194,000 inhabitants) is the chief commercial centre for the Thuringian uplands. Its lignite, rock-salt, and potash mines have given rise to salt and chemical works, while the surrounding district produces roots, especially sugar-beet. Machinery, leather, paper, soap, rolling-stock, and scientific instruments are also manufactured. Halle will receive further consideration in connexion with the industrial development of Saxony.

The Elster river rises in the Elster-Gebirge and passes rapidly through well-wooded country to Plauen (40,000 inhabitants), the industrial centre of Vogtland, and one of the principal linen-manufacturing towns in Europe. The Vogtland lies at the junction of the foothills of the Thüringer Wald and Erzgebirge, and lies outside the main coal and textile industrial districts of Saxony. Though linen is the chief industry, lace curtains and embroidery are made in both hand-loom and machine industries. Several of the villages also manufacture musical instruments. The only important centre in the Pleisse valley is Altenburg (42,000

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inhabitants), where the toys, shoes, and gloves made locally are marketed. Leipzig, at the junction of the Pleisse and Elster valleys, will be discussed in connexion with the industrial region of Saxony.

II. THE SOUTH GERMAN UPLANDS

The highland region of South Germany comprises the states of Bavaria and Württemberg and includes a large part of the basins of the Main, Neckar, and upper Danube. As in the case of the north central uplands, rain falls at all seasons, and, because of the general elevation, between 1000 and 2000 feet above sea-level the daily range of temperature is considerable. Moreover, the seasonal range, which at Munich is about 48° F., shows a gradual transition toward the continental conditions of the Central European highlands. On the other hand the physical divisions are more clearly marked, and as each division extends over a considerable area it is possible to distinguish several modifications of the forest and pastoral occupations of the people who occupy the highlands.

Physical Sub-regions

1. The **Bavarian Alps** occupy a small area in the north of the Austrian Tirol, and in the Zugspitze extend above the limit of perennial snow. The Lech and Iller rise near the snowfields of the Vorarlberg Mountains, and these supply the flood-water which is regulated by the glacial lakes of the Alpine slope. The rainfall of the Alpine zone is now utilized in a number of new hydro-electric power-stations, which are rapidly revolutionizing industrial conditions in Southern Bavaria. There are a number of small forest industries, such as the wood-carving of Oberammergau, but the principal occupation is the keeping of dairy cattle, while the upper parts are used for winter sports. The chief resort is Bad Reichenhall, which has a summer population of about 30,000. Most of the villages, however, lie at the foot of the Alps, and Kempten (22,000 inhabitants), which is at the

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upper limit of raft navigation on the Iller, was formerly the prince-abbot's centre commanding the road leading through the Schrofen Pass across the Alps. Though a former Imperial city, its commercial importance has declined because it does not command a transalpine railway route. It is an important dairying centre, and manufactures both butter and cheese, while recently a large hydro-electric station has been erected near the town, which supplies power to the cotton-mills of the Iller valley.

2. **The Alpine Foreland.** South of Munich the Bavarian plateau is covered by ground moraine which is chiefly composed of infertile gravels. As this material is unsuitable for agriculture, large areas have been left under forests which cover nearly one-third of the total area of Bavaria. North of Munich the moors, marshes, and woodlands thin out, and along the Iller, Lech, and Amper rivers there are patches of Tertiary soils and river alluvium. Moreover, the climate is warmer, and summer crops, such as rye, oats, barley, and potatoes, are grown. The average elevation is 1600 feet, and the climate resembles that of the Scottish Highlands, the rainfall being generally too heavy for wheat. Most of the area, however, is pasture-land, heath to the south of Munich and grassland to the north. In the immediate neighbourhood of Munich, Augsburg, and Ulm both wheat and hops are cultivated. Though there is a small lignite field on the south of Munich coal is absent, and water-power is the chief source of mechanical power. Both during and since the War Germany has several times suffered from a shortage of coal, and the coalless areas of South Germany have been compelled to expedite the development of hydro-electric industries. In Bavaria alone there are available about 2,000,000 horse-power, of which 540,000 horse-power had been developed and 450,000 horse-power was being developed in 1925. The power is used partly in connexion with the electrification of the Bavarian railways and partly in general manufacturing.

The electrification of the Bavarian railways is an integral part of the comprehensive State scheme for electrical power distribution over the whole of Bavaria and the linking up

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with the corresponding systems of the neighbouring states. The actual distribution is carried out from two centres, Karlsfeld, near Munich, and Meitingen, which supplies power to Augsburg, Nuremberg, Regensburg, and Landshut. These towns act as distributing stations for an area bounded by lines connecting Stuttgart, Aschaffenburg, and Bamberg. It

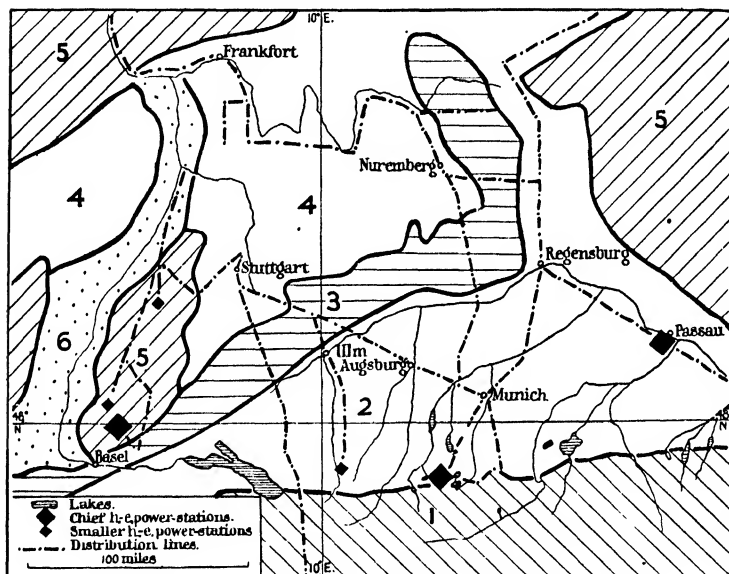


FIG. 64. DISTRIBUTION OF HYDRO-ELECTRIC POWER IN SOUTHERN GERMANY

It should be noted that there is little use for the power in Southern Bavaria, and the cost of transmitting electricity to Stuttgart, Nuremberg, and Mannheim makes it possible for these places to obtain equally cheap supplies from Rhenish Westphalia.

is proposed to link up the water-power system with Höchst, on the Main, which will serve as a link with the electrical distribution system of the Rhenish-Westphalian coalfield. It is hoped also to link up Regensburg with the Kachlet power-station near Passau, in Austria.

The largest Bavarian hydro-electric power-stations are on the Isar river, where two lakes, the Walchensee and Kochelsee, provide natural reservoirs with a fall between of more

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than 600 feet. The level of the Walchensee is regulated at Krunn by a sluice and a dam, which enable flood-water to be diverted into the Isar. The other stations are on the middle Isar at Finsingen, Aufkirchen, and Eitting. Besides the Isar the Inn has a power-station at Jettenbach-Toeving, while its tributary the Alz has several stations generating more than 20,000 horse-power—*e.g.*, Margaretenburg and Hartenholzfeld. The Lech develops 25,000 horse-power between Landsberg and Prittlaching, while the Iller now produces nearly 40,000 horse-power between Kempten and Festhofen. This power is transmitted to Ulm, where it is used in lighting and traction, and in the local industries. In fact, throughout the Alpine Foreland there is now sufficient power available for a very considerable extension of the existing industries, and especially of the textile and metal manufactures of the large towns.

The Alpine Foreland offers an easy route from the valleys of the Rhône and the Rhine to the heart of Central Europe and the Hungarian plain, while on the south there are numerous Alpine passes leading into Italy. From the earliest historical times the settlements commanding the outlets of these Alpine routes into the Foreland have been important, though those which command railways through the mountains have naturally outstripped others, such as Ravensburg (18,000 inhabitants), which was formerly an Imperial city commanding the eastern approaches of Lake Constance. Other towns grew up round the monastic houses on the pilgrimage routes from Northern Europe to Rome, and the district near Lake Constance, which possesses a somewhat milder climate than the rest of the plateau, is more densely populated (275 persons per square mile) than the other parts. Although the towns round its shores have lost their former commercial importance as route centres, they are still important as summer resorts. Lindau (8000 inhabitants) is a curious example of a town built on an island in a lake being connected with the mainland by means of an embankment and a bridge. It was an old Roman fortress and subsequently an Imperial town.

The greatest towns grew up on the great medieval trunk-

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routes from Venice to the Rhine at Constance, the Neckar at Stuttgart, and the Main at Nuremberg, Würzburg, and Frankfort. The transalpine routes brought Eastern and Mediterranean products to the bridge-towns of the Alpine Foreland, where they were exchanged for North European produce.

Munich (685,000 inhabitants) originated at the limit of navigation of the Isar at a point where an island in the river facilitated bridging. From the twelfth century it was an important salt depot, and a customs house and a mint were established there by its medieval rulers. Its early importance was due to the abundance of raw materials and to the existence of surplus labour when the pack-horse routes across the Alps were closed by snow in winter. The neighbouring forests gave rise to a number of industries, including the making of musical instruments, an industry requiring little power but considerable skill in workmanship. The nearness of the salt of the Salz valley and the existence of lignite at Peissenberg, near the Ammersee, and at Penzberg-Meisbach, south of the Walchensee, led to the development of a chemical industry, but the greatest factor in the town's development was its command of routes from the Alps to the Danube and the Rhine. During the nineteenth century Munich rose to the position of a great commercial and industrial centre because it commanded the railway route from Vienna and Linz, Prague and Landshut, Berlin and Bamberg, Nuremberg, Augsburg, Ulm, and Stuttgart, to Switzerland and Italy through Innsbrück. Munich was not especially important until railways were constructed, but afterward it soon outstripped Augsburg, Ulm, and Regensburg. The great expansion of industries during the twentieth century has been due to the development of hydro-electric power derived from the natural reservoirs, the Ammersee, Würmsee, and Walchensee, and its skilled workmen, already familiar with the manufacture of musical and scientific instruments, have easily mastered the technique of electrical and motor industries. It still retains its glass-works and carries on leather manufactures.

Augsburg (165,000 inhabitants), on the Lech, occupies a

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position similar to that of Munich at the junction of routes from Stuttgart, Constance, and Nuremburg. Like Munich, the surrounding district is cultivable, and is even more productive. It is the chief centre of the cotton and woollen manufactures of Bavaria. Ulm (with Neu Ulm 60,000 inhabitants), the Roman "Villa Regia," is the absolute limit

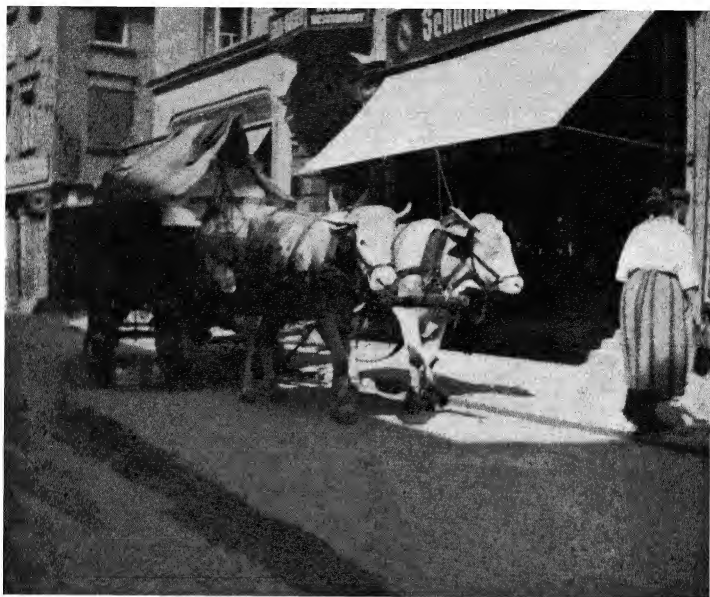


FIG. 65. AN OX-CART AT ULM

The ox-cart is frequently encountered in South Germany.

Photo L. Cundall

of navigation on the Danube, and lies where the Iller and Blau rivers enter the Danube at a point where a small island made bridge construction easy. Its command of the only bridge between Bavaria and Württemberg was made stronger by massive walls. It was a free Imperial city throughout the Middle Ages, and remained an important military centre, being the headquarters of the Fifth ("Uhlán") Army till 1920. The reduction and disarmament of the Ger-

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man army caused it to decay, and its future development will probably be bound up with the fuller development of hydro-electric power in its metal and textile industries. Its command of imports from the south enabled it to be one of the first towns north of the Alps to manufacture cotton goods, and it reached its greatest development in the fourteenth and fifteenth centuries, before the discovery of the ocean route to the East. The local skill in wood-carving has been applied to the production of exquisitely modelled articles of ivory and metal, and it shares the agricultural machinery, motor-car, and clock industries of Bavaria and manufactures cement from the limestone of the Swabian Jura. Many of its medieval industries have been modified to fit modern conditions, but its Danube trade has practically disappeared, and consists of downstream traffic in timber, cement, and stone.

3. The **Bavarian forest** is a continuation of the Bohemian plateau, and resembles the latter in its timber and cattle-rearing industries. The glacial tarns of these crystalline uplands provide natural reservoirs used in the linen industry and in the timber trade. The woodlands are still used as a source of potash for the manufacture of glass (*cf.* the Böhmerwald), the glass industry being localized round Zweisel (4500 inhabitants). Throughout the old highland region is scantily populated, and there is only one large town. Ratisbon, or Regensburg, "Castra Regina" (77,000 inhabitants), is the effective limit of barge navigation on the Danube at the point where the Regen river enters. About one million tons of German shipping is found on the Danube, and more than half of this passes through Regensburg. The site of the town was chosen for one of the Roman blockhouses along the line of the Danube, and the port still commands the canal route between the Danube and the Main. The traffic from the west consists of grain, petroleum, and fodder, while timber is floated down the Regen to its sawmills. It manufactures iron goods and machinery and exports these, together with chemicals, jute, rice, and cotton, to Bohemia and Austria. Regensburg's former importance was due to its being the outlet of the Ludwig Canal, which is connected

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with Kelheim, on the Altmühl river, and thence by canal with Nuremberg and Bamberg, the limit of navigation on the Main. At the present time, however, this route is little used, and nine-tenths of Regensburg's traffic is carried by rail. It is proposed to construct a large canal capable of taking 1500-ton ships, and as this would afford a through route between the Black and North Seas Regensburg may become an important manufacturing and commercial centre.

Passau (23,000 inhabitants) is the limit of steamer navigation on the Danube, and is easily reached by 1500-ton barges, but the river is open only in summer. The Ilz river has a considerable trade in timber, which goes through Passau. The manufactures of Bavaria also find an outlet here, especially agricultural machinery and hardware, but the imports which consist of grain and bulkier materials have to leave the river here for the railways. Passau is essentially a transshipment port, and handles a certain amount of the traffic between Swabia and Italy. The graphite-mines of this neighbourhood supply Nuremberg with material for the pencil manufacture.

4. The scarplands of the Swabian and Franconian Juras and the Triassic plateau of the Main have been preserved by a series of step-like faults along the course of the Danube between Ulm and Regensburg ('the Danube Fault') and in the borders of the Thüringer Wald, the Vogelsberg, and the Black Forest. The southern edge of this region of subsidence consists of Jurassic scarplands which form a continuation of the Swiss and French Jura from the frontier of Germany near Schaffhausen to the Böhmerwald and Fichtelgebirge, in Northern Bavaria. Being at a somewhat lower elevation, this region may be distinguished from the Alpine areas by its higher summer temperatures.

(a) The *Swabian and Franconian Juras* form a tableland lying between 1500 and 2500 feet above sea-level, with a wide gap on the north-west of Donauworth, the 'Nordlingen Depression,' below the 1500-feet contour. Command of this gap, through which many routes cross, was of great importance till a comparatively recent date. The region resembles that of the higher parts of the North Yorkshire moors in

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that its surface consists of Jurassic limestone clothed with poor moorland pasture. Iron ores are mined in one or two places, and there is a widespread manufacture of small metal goods—*e.g.*, there are metal-works at Amberg, on the Prague-Nuremberg railway route, at Bayreuth, at Göppingen (22,000 inhabitants), at Esslingen (40,000 inhabitants), on the Fils river, at Geislingen (14,000 inhabitants), on the Steige river, at Tuttlingen (17,000 inhabitants), on the railway between Stuttgart and Zürich, at Friedrichshafen, on Lake Constance, at Ansbach (24,000 inhabitants), and at Singen, on the railway leading to Schaffhausen. Gmünd (21,000 inhabitants) specializes in fine metal industries and produces gold and silver articles. Schwenningen (19,000 inhabitants), on the Neckar, manufactures clocks. The absence of coal has made it necessary for the towns commanding the routes through the Jurassic scarps to specialize in industries which require a high degree of skill but little power. Many of the towns owe their origin to their ecclesiastical or military importance in the Middle Ages—*e.g.*, Ansbach was a monastery on the pilgrim route between Würzburg and Rome, while Nordlingen, on the Eger, has been a castle-town since the ninth century, its present fortress, like that of Rothenburg, on the Tauber, dating from the fourteenth century.

The scarplands are therefore a pastoral region with a number of ancient towns whose picturesque appearance in the midst of excellent tramping country forms an attraction to large numbers of German holiday-makers in the summer months. The towns possess a variety of industries based on local minerals and on the woodlands and pastures of the upland districts. Amberg (26,000 inhabitants) is a mining centre producing graphite, kaolin, ironstone, and quartz sand. It possesses glass, porcelain, iron, and timber industries. Solnhofen's slate-quarries have been worked since the time of the Romans, the slate being used in lithography. Tübingen (20,000 inhabitants), on the Neckar, is an old university town specializing in medicine and theology. Its position on a pilgrim route between the Protestant North and the Catholic South made it a great centre of religious and medical controversy, from which it developed during the latter part

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of the nineteenth century into one of the principal centres of anthropological research. Tuttlingen, on the Danube, was a monastic centre in the eighth century. It has developed boot and shoe and scientific instrument industries, and because of the peculiarly fertile nature of the local soils specializes in nursery gardening. As might be expected in a pastoral and forest area, textile and paper industries have developed at Göppingen, Allenthalben, Bamberg, and Bayreuth, while Esslingen has a large number of small industries, including the manufacture of leather, textiles, locomotives, and metal goods of various descriptions. Wine is also produced in this neighbourhood for local consumption.

(b) The *Triassic plateau of the Main and Neckar basins* possesses an excellent summer climate, for though in winter the temperature falls as low as 10° F., in summer the average temperature for July reaches 70° F., so that it is possible to cultivate wheat and sugar-beet. Moreover, more than half the total area is arable (*cf.* about 35 per cent. in Southern Bavaria). Though the proportion of the arable area which is under oats, barley, and potatoes is about the same as in the Alpine Foreland, considerable quantities of wheat and sugar-beet are grown, and vines, which cannot be grown south of the Danube, make their appearance in the valleys of the Neckar and Tauber and in the district of Würzburg. Hemp, flax, hops, tobacco, and other industrial crops are grown, and fruit-trees are to be found throughout the plateau. Nearly a quarter of the plateau is covered with permanent pasture, and large numbers of cattle are raised. Salt is the principal mineral of the Triassic region, and is mined in the Neckar and Kocher valleys and in the Saale district of the Main river basin, at Bad Kissingen (35,000 inhabitants).

The Neckar formed one of the principal traffic lines of the Middle Ages, and timber was floated down it to the limit of navigation, at Stuttgart. Several of the tributaries rise in the Black Forest, and the villages and towns of these rivers share the industries of the Black Forest. Stuttgart (343,000 inhabitants) was the limit of barge navigation of the Neckar

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throughout the Middle Ages, when land-routes converged from the Rhine in Switzerland and from south of the Danube. Its control of routes and the necessity for break of bulk at this point made it the capital city of Württemberg, and its possession of local raw materials—flax, wool, salt—and the timber and minerals of the Black Forest, combined with the seasonal surplus of labour when the Alpine passes were closed, gave rise to textile, metal, salt, and timber industries. Its present importance is largely due to the fact that it is the administrative centre of Württemberg, which was enlarged by Napoleon, and, as a result, has become the great railway centre of that state. It is within easy reach of coal and water-power and has developed the manufacture of paper, leather, and cotton goods, scientific and musical instruments (*cf.* Bayreuth), and beer. Its chemical industry is based upon local salt and coal brought from other states. Heilbronn (45,000 inhabitants) lies farther down the river, at the limit of steamer navigation, though barges can reach Cannstadt, a suburb of Stuttgart. Heilbronn mines salt in the local muschelkalk formation, manufactures iron goods, and is rapidly increasing in importance for the handling of goods carried by water from the Rhine valley.

The Main rises in Franconian Switzerland and is navigable for barges from Bamberg. Bamberg (50,000 inhabitants), on the Regnitz, Bayreuth (35,000 inhabitants), on the Red Main, and Hof (41,000 inhabitants), on the Saale, lie near the sheep-walks of the Franconian Jura and the Fichtelgebirge, and, as a result, they have developed woollen manufactures which have given rise, in turn, to cotton-spinning and -weaving, industries which demand soft water for washing and dyeing, and which are easily developed in consequence of the abundance of local water-power. Bayreuth is the chief town of Upper Franconia, and has developed spinning and weaving, china, furniture, and engineering industries. Bamberg owed its early importance to its command of the passes leading from the navigable part of the Main to the Saale and the Elbe basin. At the present day it is the limit of the Main navigation and the northern terminus of the Main-Danube Canal. Its industrial import-

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ance is due to its position on the trunk railway route between Nuremberg and Berlin. The heavy gradient of the railway route over the Thüringer Wald to Rudolstadt and Jena necessitates the maintenance of engine-works. The surrounding district is extremely fertile, and there are numerous hop-gardens near the town. The neighbourhood furnishes the raw materials for its starch, tobacco, beer, woollen, and leather industries, but cotton-spinning and -weaving are also carried on.

Throughout this part of Central Europe the route centres have often obtained their railway connexions for other than geographical reasons. Thus the railway between Stuttgart and the Rhine was made to pass through Pforzheim instead of through Bruchsal because of the personal influence of an actress and against the advice of one of the greatest railway engineers of the age. It is probable that many excellent sites for railway centres were overlooked during the great period of expansion which accompanied the construction of railways between 1840 and 1880. There is no doubt that the construction of railways has been the greatest single factor in the development of the great urban centres of Central and North-west Europe, and that the geographical inertia of the centres so established operates against those towns, such as Regensburg, which seem to offer superior geographical advantages. We find that the earliest railways on the upper Danube centred at Ulm, which is well above the limit of effective navigation.

Nuremberg, or Nürnberg (393,000 inhabitants), lies where the Main-Danube Canal joins the Pegnitz river. This is about the centre of the Regnitz or upper Main basin. It became important at a very early date, when it was the limit of the Main river navigation and the focus of land-routes leading from the Danube and Neckar basins. As the transshipping point for goods carried overland from Italy and the Danube to North-west Europe it developed local industries, and as it was in the centre of a fertile district its population was able to grow in numbers, so that it retained its skilled workmen. At the present day it owes practically nothing to the Main-Danube Canal and everything to its

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railways. The first railway constructed in Germany was a short line from Nuremberg to Fürth, and this was soon extended to Donauworth and Augsburg, and along the Main valley to the Rhine, the junction at Bamberg giving communication with Cassel and across Thuringia to Leipzig and the Elbe valley. As a result, Nuremberg has become one of the principal railway centres in Germany. It is a long way from coal and from export markets, and in consequence its industries are those which require highly specialized methods rather than large quantities of power and raw materials. This high degree of specialization is maintained by its technical schools, which cater for typical local industries, such as the making of metal ornaments, clocks, and goldsmith's ware, ivory-carving, book-binding, and wood-carving. It manufactures machinery, toys, sheet metal and steel goods, gold-foil articles, mathematical instruments, pencils, glassware, electrical equipment, gingerbread, and beer, all of which are dispatched long distances by rail. It is the principal hop-market in Bavaria, and supplies Munich.

The other towns of the upper parts of the Main basin are small cattle markets with local dyeing, sugar-refining, and engineering industries—*e.g.*, Schweinfurt (28,000 inhabitants). Würzburg (92,000 inhabitants) originated early in the eighth century as a castle-town commanding a crossing of the Main, and soon became a centre of missionary work. It developed into a prince-bishopric, and by the fourteenth century it had a considerable local market with woollen and boat-building industries. These have continued to the present day, but the relative importance of the town has declined because it is not at the focus of railway routes. It is the centre of the Main wine district and manufactures leather, paper, surgical and mathematical instruments, and machinery.

Frankfort (540,000 inhabitants) originated at the point where the great north-south route from the Main and Neckar met navigable water, and it has retained its river-trade to the present day. The surrounding district is the most fertile part of the Main basin, and supported the original Frankish nation. Not only was it an Imperial city; it was actually the residence of several of the Emperors, and

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became an important centre for fairs. Its administrative importance, the abundance of local produce, and its accessibility for large boats gave rise to the manufacture of textiles, and its carpet, table-cover, oilcloth, cotton, silk, and woollen industries are still important. The local forests gave rise to paper manufactures. One-tenth of its population are Jews, and it is noteworthy that the wide tolerance extended by Frankfort (in contrast to Würzburg) had much to do with its development as a great banking centre (*cf.* Amsterdam). During the nineteenth century Frankfort became an important railway centre, possessing chemical, leather, machine, motor, electrical, and luxury industries. It deals to a considerable extent in bulky commodities, and about 1,500,000 tons of goods are exchanged there annually. There are several important towns in the lower parts of the Main basin. Offenbach (79,000 inhabitants), founded by French refugees after the Revocation of the Edict of Nantes, specializes in fancy goods of leather and lace, and has developed engineering industries. Hanau (52,000 inhabitants), at the junction of the Kinzig and the Main, manufactures silk goods, ribbons, hosiery, and cotton fabrics. Its timber was formerly used for the making of wine-barrels, and it still specializes in gold and silver articles. Aschaffenburg (34,000 inhabitants), at the confluence of the Aschaff and the Main, is the limit of navigation for large barges. Its timber is used for the construction of barges and the manufacture of paper. It lies within the wine district, and produces woollen goods. In the district which lies between the Main and the Neckar, Rothenburg, on the Tauber, and Ellwangen, on the Jagst, were formerly important military and ecclesiastical centres on the routes between the Main and the Danube, but they lost their administrative importance during the Napoleonic wars, when many small feudal and ecclesiastical units were destroyed. Rothenburg still possesses a small woollen industry, but is otherwise an unimportant local market. Ludwigsburg (30,000 inhabitants), near the confluence of the Enz and Neckar valley routes, manufactures iron, woollen, cotton, and linen goods and has small pottery, leather, jewellery, and musical instrument industries.

CHAPTER XVIII

GERMANY: THE GERMAN HIGHLANDS—*continued*

III. THE UPLANDS OF THE RHINE VALLEY

THE Rhine gives a measure of unity to many diverse regions which all look to the river and its valley as their chief route. (See page 350, where the Rhine is treated in detail.) Physically the Rhine uplands consist of the crystalline highlands of the Black Forest and Odenwald, the Carboniferous and Triassic plateau of the Westrich and Hardt, and the Lower Primary uplands of the Hunsrück, Taunus, Westerwald, Eifel, Sauerland, and Bergland, known generally as the Rhine massif. These highland districts have severe climatic conditions which are comparable with those of the north central uplands. There is, however, a marked rain-shadow on their eastern slopes. In fact, the north-east of the Bavarian Palatinate is as dry as the western part of the Saale valley. Elsewhere the abundant and well-distributed rainfall encourages dense forests on the hill slopes. The level tablelands that lie above the limit of timber production are covered with moors, which provide pasture for sheep and moorland cattle. The drier and sunnier slopes, especially in the Moselle and Rhine basins, produce vines. The crystalline and Primary outcrops have mineral springs which have led to the establishment of health resorts at Baden-Baden (25,000 inhabitants), with twenty hot springs (120° F.), at Wiesbaden (100,000 inhabitants), and at Homburg (16,000 inhabitants). Deposits of iron ore are worked in the valleys of the Sieg and Lahn, and there are many old copper, silver, tin, lead, and zinc mines. Though most of these have been abandoned, fine metal-working and jewellery industries are carried on in several of the towns—*e.g.*, Pforzheim. Lead and zinc are still mined near Stolberg, south of Aachen, but coal is found only in the Saar basin and near Aachen. Lignite occurs in the Taunus and Westerwald, though the

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principal mines lie to the east of Köln (Cologne), on the south-west of Sauerland. The Triassic plateau contains deposits of salt and glass sands, which are the bases of the industries of the Saar coalfield.

1. The Black Forest and Odenwald

The granite uplands of the Black Forest form a barrier which forces traffic into the Neckar and upper Rhine valleys.

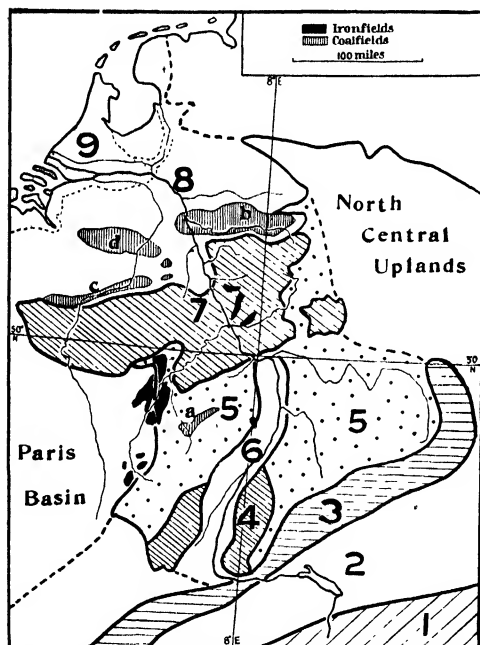


FIG. 66. SKETCH MAP OF THE RHINE VALLEY

1, Alps; 2, Alpine Foreland; 3, Franconian and Swabian Juras; 4, Black Forest; 5, Triassic plateaux of the Main, Neckar, and Moselle basins; 6, Rhine Rift Valley; 7, Rhine plateau and Vogelsberg; 8, lower Rhine plain; 9, Rhine Delta.

Coalfields: a, Saar; b, Rhenish and Westphalian; c, Sambre-Meuse; d, Campine, South Peel, and Aachen.

The command of the approaches to Eastern France makes this an important frontier region of great military importance. In former times the mineral wealth was considerable, but the mines are now practically exhausted. Pforzheim (79,000 inhabitants), commanding the northern entrance to the Black Forest, was the former residence of the Margraves of Baden, and has an important goldsmiths' industry. In this neighbourhood many mineral springs have given

rise to spas, such as Wildbad. The climate is transitional between continental and maritime conditions, but the autumns

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are sunny and relatively dry, so that the vine ripens on favourable slopes. The hills are forested, but the woods are not ruthlessly exploited, smoking being forbidden in those which are frequented by tourists. The thinnings are made into pitprops and sent down the Rhine and Neckar valleys by rail to Mannheim for transhipment to the Ruhr coalfield. Artificial silk is manufactured near the Swiss frontier at Basel. After 1870 the Black Forest lost its importance as a frontier region, and its industrial life is consequently of a domestic character, which does not interfere with the enjoyment of the tourists who visit the district (see frontispiece).

In the Gegensatz district the subsoil consists of muschelkalk, and excellent crops of tobacco, hops, corn, and fruit are grown, but in the central districts the soils are derived from the Bunter Sandstone, which gives rise to a timber and grass country with cattle-breeding, woodwork, clock, and straw-plait industries. In the neighbourhood of Lörrach (16,000 inhabitants) domestic brush and textile manufactures are carried on in connexion with the cotton and silk industries of Basel (page 99).

During the past ten years successful attempts have been made to harness the water-power of the Black Forest rivers, but unlike Switzerland, where the development of hydro-electric power is of vital importance, in Baden the problem of power is a question of relative profit, and coal-power is somewhat cheaper than water-power. Because of the high initial cost of constructing hydro-electric plant it is improbable that Germany will be able to develop the whole of the water-power to which she is entitled in the Rhine valley. On the upper Rhine there are large hydro-electric power-stations at Augst, Rheinfelden, and Laufenburg, the power being distributed between Germany and Switzerland, and chemical industries are beginning to make their appearance in the Black Forest region.

In the Neckar basin the Schwarzenburg hydro-electric power-works supply Stuttgart, but elsewhere find few markets. More than three-quarters of a million electrical horse-power are available in the state of Baden alone, but only one-quarter of this has been developed. Water-power has

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displaced coal in the leather, textile, metal-working, pottery, and scientific industries of the small towns, but the bulk of the power is sent to Stuttgart. Reutlingen (51,000 inhabitants), on the Neckar, develops only 1000 horse-power, an amount equal to that used for the saving of coal in the little hydro-electric power-station above York, on the Ouse.

Freiburg (90,000 inhabitants), where the Dreisam valley enters the Rhine plain, is the chief town of the Black Forest. Formerly important for its minerals, it is now a tourist centre, with local timber, wine, and textile industries. Heidelberg (73,000 inhabitants) commands the gap where the Neckar breaks through the high land. It was strongly fortified during the Middle Ages, and has the oldest university in Germany.

2. The Triassic Uplands of the Bavarian Palatinate and the Saar Valley

The Bavarian Palatinate consists of two very closely marked physical regions—the Rhine plain and the Triassic plateau which lies to the west of the Hardt escarpment. Through the Triassic rocks the Saar coalfield outcrops, and south of the Nahe valley are areas of igneous rocks. Neither the Nahe nor the Lauter is navigable, and railways are the principal means of communication.

The uplands have an annual rainfall of about thirty-three inches (*cf.* twenty-seven inches in the Rhine valley). They are also somewhat cooler than the Rhine plain. The generally sheltered situation, however, results in a much milder climate than is used in the upland districts of Germany. The Bunter Sandstone soils are not very fertile, and much of the upland is covered by woods and heaths. Two-fifths of the area of the Palatinate is forested, especially in the Pfälzerwald, which occupies a quarter of the total area of the state. Even in the Landstuhl depression, where peat-bogs have been partially drained, a good deal of the land is under birch-woods and heaths. In the Saar valley practically the whole of the timber has disappeared because of the high degree of industrialization of the coalfield, but in the

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neighbourhood of the Hardt pitprops are cut and paper, woollen, and leather industries are carried on.

The slopes of the eastern river valleys as well as the more open country of the Rhine plain produce more than one-third of the total wine output of Germany. The chief upland vineyards are at Deidesheim, Dürkheim, Neustadt, Landau, and Bergzheim, while those of the Rhine plain are at Germersheim and Speyer. Orchard fruits are grown in the same district and jam is manufactured at Deidesheim. In the higher parts potatoes and rye are the chief crops, while barley and oats are grown on the borders of the Rhine plain. Hops are confined to the more fertile soils, except in the Saar valley, where potatoes are the chief crop, being grown for local consumption.

The Saar Coalfield

The chief coal area lies across the Saar valley in a north-east-south-west depression between St Wendel and Neunkirchen on the north-east and Boulay and Falkenburg (Faulquemont), in Lorraine, on the south-west. The coal lies nearest the surface in the Saar valley, where mining is carried on between Saarlouis and Saarbrücken, and in the north-east near Dudweiler, Friedrichstal, and Neunkirchen. Toward the north-east and south-west the coal dips downward to inaccessible depths. In the north-east of the Palatinate coal seams have been traced almost to the confluence of the Glan and the Nahe, but the only parts where coal has been mined are to the north-east of Neunkirchen and north-west of Homburg—*e.g.*, at Potzberg. The district to the north-east of these mines offers no likelihood of profitable mining. The Saar coalfield is bounded on the south-east by a long fault, and beyond this the coal lies at much greater depths (6000 feet below the surface) and dips south-eastward toward Zweibrücken and Bliesbrücken. The only German mines within this area are near St Ingbert, Peissenberg, and Mittel Bexbach, where there are blast-furnaces and steel-works. Although nearly a quarter of the Saar coalfield lies within the Palatinate the output of coal outside the Saar Territory

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is small (three-quarters of a million tons). The plebiscite which will be held in 1934 will decide the political future of the Saar Territory, and the future development of the coal area of the Palatinate depends on the final settlement of this frontier.

Lignite is mined near Dürckheim, on the edge of the Rhine plain, while peat is dug in the Landstuhl depression. Salt is mined near Saarlautern, and, together with that obtained from Château-Salins, is used in the chemical-works of the Saar valley. Practically all these mines are now the property of French companies. Pottery clay and glass sands are also used locally in the pottery and glass-works of the Saar valley. Granite and basalt are quarried in the Glan valley for road-metal. The towns of the Saar Territory have already been considered (page 92). These of the Bavarian Palatinate are much smaller. Kaiserslautern (59,000 inhabitants), commanding the entrance of the Landstuhl depression from the Speyer valley, the chief town of the uplands, has timber, hardware, and machine works and manufactures yarn. St Ingbert (20,000 inhabitants), on the frontier of the Saar Territory, shares in the coal, iron, and glass-blowing industries of that region. Pirmasens (42,000 inhabitants), at the junction of forest and pasture-lands, has become the principal boot-and-shoe-manufacturing centre of Germany. The other towns command routes leading to the Rhine plain. Landau, where the Zweich river reaches the plain, is the outlet of an important wine and timber district, and manufactures tobacco. Neustadt (20,000 inhabitants), on the Speyer, was a Roman station, and shares in the wine and hardware trades. Aluminium is made at Mussbach.

3. The Plain of the Rhine Rift Valley

The plain of Baden has moderately rich soils, though these are less fertile than those of Alsace. The climate also is considerably damper, and more than a quarter of the arable land is under oats, potatoes, and vegetables. Orchard fruits occupy considerable areas, but wheat and wine are less

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important than in Alsace. Few towns are actually on or even near the banks of the Rhine, and the chief centres of population are where the railway which follows the river terraces crosses the tributaries which enter the Rhine. The only places of any size are the Rhine ports. The Baden port opposite Strasbourg is Kehl, where the Kinzig river-mouth is utilized for docks. Though in an excellent position for Rhine trade, Kehl has not been able to develop freely since 1919 because it was within the occupied zone till 1930, and was cut off for a time from railway communication with the rest of Germany. In the neighbourhood of Karlsruhe the Rhine valley widens and gives easy communications both along and across the river.

Karlsruhe (148,000 inhabitants) has taken the place of the former capital of the duchy of Baden-Durlach, which held the Pfalz valley route to the Enz and Neckar valleys. In 1688 Durlach was destroyed by the French, and the new Margrave rebuilt his capital farther out in the plain at Karlsruhe. Here the timber of the Black Forest has given rise to furniture, rolling-stock, and artistic industries, and the nearness of the metal-working centres of the Black Forest has caused silver- and nickel-plating industries to develop. A short canal connects Karlsruhe to the Rhine and brings it into close commercial relations with the industrial areas and ports of the lower Rhine. Its manufactures include machinery, paper, and pottery. The little town of Bruchsal (16,000 inhabitants), where the river Saal gives access through the Black Forest to the Neckar, was the seat of a prince-bishop, and was chosen by Vignobles as the most suitable centre for the first railway from Stuttgart to the Rhine. Unfortunately this railway was not constructed until many years after the trunk-route through Pforzheim and Karlsruhe had been established. In consequence Bruchsal is now completely overshadowed by Karlsruhe. Except in the railway centres the plain of Baden is a purely agricultural area, with such domestic industries as straw-plaiting, wood-carving, and the making of clocks and ornaments, and there is a striking contrast between the countryside, with its delightful old-fashioned farms, and the town of Karlsruhe, with its ornate

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sculpture and pretentious domestic architecture. Nevertheless, Karlsruhe is noteworthy as one of the earliest examples of modern town-planning.

The point where the Neckar enters is the centre of routes from Holland and Switzerland, and the towns which have been built there have twice been destroyed by war. The present town is of modern origin. After the massacre of St Bartholomew there was an influx of French refugees, and in 1721 ecclesiastical disputes caused the Elector to transfer his residence from Heidelberg to Mannheim. In consequence of its becoming the limit of bulk-cargo navigation—*i.e.*, for vessels of 2000 tons—on the Rhine and the centre of a railway net which connects it with most parts of Central Europe, Mannheim has become the largest and most important of the German towns of the upper Rhine and the chief transshipment port and trading centre of South Germany. Here the goods destined for Strasbourg and Basel have to be placed in smaller vessels—generally 1500-ton barges—and grain, coffee, petroleum, coal, rubber, and other raw materials are imported in bulk for distribution by railway throughout South Germany. Some of the raw materials are manufactured locally, and there are large breweries, flour-mills, celluloid and machine works. Local materials are used in the tobacco and sugar industries, but at the present day the woollen-mills depend chiefly on imported wool and specialize in the production of piece goods. (For river traffic see page 352.)

The plain of the Palatinate resembles Alsace in its production of wine and wheat. Maize is grown, as the late summer is warm and sunny, and ripening is able to take place during dry weather. Tobacco, potatoes, and sugar-beet are also important. Near the banks of the Rhine there is a large area of good cattle pasture, which has given rise to the leather industry of Worms. This town of 47,000 inhabitants was the Roman centre of Borbetomagus, and later the capital of the Burgundians. As a free city it obtained commercial privileges from Emperors, and, with Mainz, was the head of the confederation of Rhenish towns in the thirteenth century. Ruined by the Thirty Years War and

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burned down in 1689, it remained a mere village until the nineteenth century, when trade revived. It is the centre of a rich cattle and wine district, the "Wonnegau." Speyer (25,000 inhabitants), the confluence of the Speyer and the Rhine, has been occupied since before Roman times, when it became "Augusta Nemetum." With other Rhine towns it was burned in 1689. It remains the capital of the Palatinate and the market for the wine of the Speyer valley. Paper is manufactured from the timber of the Hardt.

Founded by Calvinists banished from Holland by the Spaniards in the sixteenth century, Frankenthal (24,000 inhabitants) is connected to the Rhine by a short canal. Its porcelain industry has now disappeared, while its old bell-founding has developed into the manufacture of printing-presses and wire nails, an instance of the need for specialization when cheap water-transport is no longer available. Ludwigshafen (102,000 inhabitants) was a hamlet of forty people at the beginning of the nineteenth century, but its position opposite Mannheim has made it a great port. During the German occupation of Alsace-Lorraine it became an important railway distribution centre, and its population increased from less than 8000 to more than 100,000. This period coincides with that of the growth of the great German chemical industries, which depended on the cheap transport of coal and salt. After 1905 the potash deposits of Alsace were developed, and the cheapness of land at Ludwigshafen enabled it to become the chief centre of Germany's chemical industry. Its sulphuric acid is made from imported ores, its chlorine from the salt of South Germany, and its dyes from the coal-tar products of the German coalfields. One-quarter of the organic dyes produced in Germany are made at Ludwigshafen.

The plain of Hesse lies across the Rhine, near its junction with the Main. Its left bank continues the wine district of the Palatinate, with centres at Nierstein, Oppenheim, and Bodenheim. On the eastern shores there are fields of oats and potatoes similar to those of Baden. Wheat is more important than in Baden, and there is a considerable production of leather. Darmstadt (89,000 inhabitants) owes its

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importance to being the capital of Hesse and to railway communications with Mainz, Frankfort, Mannheim, and Heidelberg. It is also the principal market for the eastern part of the Hessian plain. Mainz (108,000 inhabitants) originated as a Roman fortress, Mogontiacum, commanding the outlet of the Main valley. A smaller castellum, Castel, was built on the opposite shore of the Rhine, and the two places formed one of the earliest Christian bishoprics in Germany. The prince-bishopric of Mainz became one of the leading members of the commercial confederation of the Rhine, and because of its staple rights it remained the chief commercial centre of the upper Rhine throughout the Middle Ages. It is still an important port, but railway competition has recently caused its river traffic to decline. It is the centre of an important wine industry at the entrance of the famous Rheingau district and is a popular tourist resort. Mainz is one of the chief leather centres in Germany, and has subsidiary soap and glue industries. The timber of the surrounding uplands has given rise to the manufacture of furniture and scientific and musical instruments. Porcelain and metal goods are also made there. Bingen (10,000 inhabitants), at the junction of the Nahe and the Rhine, commands the southern entrance of the Rhine gorge. An old Roman fortress, it is only a small town, a market for Rheingau wine, with leather and chemical industries.

4. The Uplands of the Rhine Plateau

Except for Triassic fragments which have been preserved on the Luxemburg border near Trèves, on the south of Düren, and near Hillesheim and Montmédy, the whole of the Rhine plateau consists of Lower Primary rocks, with igneous intrusions in the Coblenz, Westerwald, and Bonn districts.

The Hohe, Venn, Eifel, and Hunsrück region is a continuation of the Ardennes plateau, and is drained by fast-flowing rivers. The Ourthe and Semois enter the Meuse in Belgium, the Sauer is navigable to Diekirch, in Luxemburg, the Kyll enters the Moselle near Trèves, the Ahr enters the

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Rhine at Linz, and the Erft joins the Rhine at Grimlinghausen, and, by means of the Erft Canal, at Düsseldorf. The Roer joins the Maas at Roermond. The valleys are forested, and the higher parts of the plateau are moorlands. During the nineteenth century parts of the Eifel district were turned into grassland. The initial cost was heavy, and the use of fertilizers is still necessary. The Montjoie plateau was formerly the barren wind-swept Platte Venn, but draining, constant manuring, and the planting of hedges have changed poor moorland into meadows. In other parts pines and firs have been planted on the higher slopes. In the Montmédy district, now ceded to Belgium, the Wallonische Venn is being drained, cultivated and colonized. Nearly a third of the Rhine province is now under forest, chiefly in the Moselle, Hunsrück, and North Eifel districts. Most of the trees are deciduous, and oaks were formerly important for tanning industries. At the present time the use of oak bark has been discontinued as a result of competition from South American quebracho. The timber is marketed in Cologne, Duisburg, Krefeld, and Essen. In the more sheltered parts fruits are grown, including apples, pears, plums, cherries, peaches, and walnuts. Vines are cultivated in the Rheingau, Nahe, Moselle, and Ahr districts, but four-fifths of the wine produced comes from the Moselle and lower Saar. Throughout the plateau large numbers of cattle, pigs, and goats are raised, sheep being less important. In the lower parts of the valleys co-operative and State improvements have been made in draining (by winter dikes) and in stock-breeding.

Copper has been mined in the Eifel limestone near Eupen (now Belgian), in the Mayen district, and near Neuwied. Lead occurs in many parts of the Schiefergebirge, and is associated with zinc in the Stolberg (Aachen) and Bensberg districts. The zinc deposits are valuable and affect the international importance of the Lontzen-Moresnet district. Manganese ores have been found in the Saar valley at Schleiden and at Münster, near Kreuznach. As in other highly faulted regions of Primary age, there are many mineral springs, and the Ahr-Maifeld district is especially important

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for mineral waters—*e.g.*, Apollinaris. There are spas in the Central Eifel at Daun and Gerolstein (*cf.* Eupen and Spa), in the Hunsrück at Kreuznach (27,000 inhabitants). The Hohe Venn has a considerable amount of water-power, and the Urft valley reservoir, which supplies Düren, develops hydro-electric power which is used locally. Wine is marketed in Coblenz and Kreuznach, and leather is made in the latter town and near Trèves. Timber manufactures are carried on where the rivers enter the lowlands—*e.g.*, Trèves and Coblenz make furniture and pianos and Düren has paper-mills. Lack of coal accounts for the absence of large-scale manufactures.

Except in the neighbourhood of Aachen (156,000 inhabitants), which has a local coalfield, the population of the western uplands is scanty. Aachen lies at the centre of a number of small valleys whose streams meet in the amphitheatre of hills which partially surround the town. The most important route is the old Roman route from Liège to Cologne, now a great international railway route. A number of mineral and warm springs emerge from the Lower Primary outcrop at Aachen, and the Romans chose this spot for their baths, the site being still used as a hydropathic. With coal and water-power Aachen has developed woollen, silk, dyeing, and glass industries. Chosen as a residence by Charles the Great, its political importance was formerly considerable, but it is now close to the frontier, a disadvantage, because tariffs keep Aachen's products out of Belgium and Holland.

The uplands of the east of the Rhine include the Rheingau, Taunus, and Sauerland districts, which resemble those of the west. The Rheingau, which lies between Bingen and Wiesbaden, has a long south-facing slope, sheltered from northerly winds, and is the principal wine district of the Rhine valley. The mildness of the climate and the existence of mineral springs have helped Wiesbaden (151,000 inhabitants) to become the chief health resort of the Rhine valley. Reference has already been made to the upper Lahn (page 303), which rises in the Vogelsberg. Giessen (34,000 inhabitants) commands the gorge leading to the navigable lower Lahn. The Lahn and the Sieg drain a mountainous area

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which for many centuries has had iron industries based on local ore, timber, and water-power. At the present time the lower Lahn district sends manganese ore from Giessen and iron ore from Wetzlar to the furnaces of the Ruhr. Wetzlar (18,000 inhabitants) has a number of iron-mines, blast-furnaces, and chemical and scientific-instrument works. Although the Wied valley, draining the south of Siegerland, resembles the western uplands in its pastoral industry, industrial life is generally more developed on the east than on the west of the Rhine. The lignite of Höhr and Montabaur is used in local spinning and leather industries. Neuwied (20,000 inhabitants), at the junction of the Wied and the Rhine, is the market for a district where the Rhine valley widens out somewhat, producing grinding machinery, musical instruments, and hardware, in addition to starch, tobacco, and chicory. The Sieg follows a deep trench in the Lower Devonian plateau. Its chief importance lies in the spathic iron ores mined in the Siegen district. Siegen (32,000 inhabitants) has developed a special type of meadow-farming, and is an important centre of iron and steel manufacture. Both slate and basalt are quarried in the neighbourhood. The Sieg does not become navigable until it enters the Rhine plain, near Siegburg, where a hill of igneous rock commands the entrance of the eastern valleys. Originally an eleventh-century abbey, Siegburg has an ordnance factory and manufactures metal goods of the Birmingham type, using gold, silver, copper, lead, nickel, and aluminium. In fact, the whole of the Sieg valley is highly industrialized, and in addition to the wire, needle, pen, paper, and leather industries there are calico-printing works. Prior to the opening up of the Ruhr coalfield Siegerland was the chief centre of the German iron industry, and it still produces considerable quantities of iron and steel.

Most of the Rhine plateau consists of Lower Devonian rocks, but in Sauerland Upper Devonian deposits are found at the surface. The relief is more broken and the hill slopes are covered with oaks, and there is some meadowland in the valleys. The Sauerland rivers are the Wupper and the tributaries of the Ruhr. The Wupper rises in the Ebbe Gebirge,

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an inlier of Lower Devonian rocks. Like most of the streams of the area, the headwaters are used to drive water-wheels. In fact, the Wupper is said to be Germany's busiest river. The water-wheels are used for the grinding of flour and in local manufactures. Recently twenty barrages have been established in Sauerland for water and hydro-electric power supplies. The Wupper basin has several reservoirs, but it is in the neighbourhood of Barmen and Elberfeld that the greatest industrial development has taken place. Here the co-existence of water-power and sheep pastures led to the rise of woollen manufacture, and in 1608 a large number of Cologne Protestants were expelled and carried their industries to Krefeld, Elberfeld, Düsseldorf, and Mülheim. In the narrow valley of the Wupper Elberfeld-Barmen (350,000 inhabitants) has become the Manchester of Germany, and produces cotton yarn, cloth, and calico, together with woollen and silk goods. A little farther downstream local timber, ore, grindstone material, and water-power gave rise to the cutlery industry of Solingen (135,000 inhabitants), where a number of small streams flow westward to the Rhine. This town specializes in fine steel goods and small arms (*cf.* Liège), and has large steel-works and paper-mills. Remscheid (99,000 inhabitants) occupies a similar situation on the east of the Wupper, and specializes in skates and other steel goods. Schwelm (22,000 inhabitants) lies to the north-east of Barmen, and has both iron and textile industries. The Wupper enters the Rhine plain at Opladen, but as it is not navigable there is no port at its mouth.

The upper valleys of the Ruhr basin include the Volme, Ennepe, Lenne, and Hönne rivers. The Ennepe rises near the source of the Wupper and flows northward through the hydro-electric power reservoir at Ebbinghausen to Gevelsberg, which manufactures ovens and hearths. At Haspe (26,000 inhabitants) it is joined by a smaller stream, the rivers being dammed to provide water and electrical power for the blast-furnaces, foundries, and steel-works. Haspe makes scythes, metal fittings, screws, and railway equipment. The Volme rises to the north-east of the source of the Wupper at about 1200 feet above sea-level, and, like the other rivers,

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flows in a deep trench through well-wooded country. There are numerous water-mills, but as the whole of the district lies above the 1000-foot contour there is little cultivation, and the villages rely on timber-cutting and on grazing, while there are numerous basalt-quarries. At the junction of the Volme and Ennepe is the large industrial centre of Hagen (143,000 inhabitants), which has iron-foundries, toy, hardware, and electrical industries, and paper- and textile-mills.

The Lenne rises on the well-wooded slopes of the Rothaar-Gebirge. Its water-mills supply power for the timber and agricultural industries of the little textile manufacturing town of Schmallenburg. The Bigge river rises in the south-west of the same district and has a number of sawmills—*e.g.*, at Olpe, near the Lister barrage. Several small streams enter the Bigge river at Attendorn, which has rolling-mills and lime-works. Farther down the Lenne the towns increase in size and importance, and may be considered as part of the Rhenish-Westphalian industrial region. Lüdenscheld (33,000 inhabitants), on the Ebbe Gebirge, has dammed several streams entering the Volme and Lenne. It is a picturesque summer and winter resort, and specializes in the production of finished metal goods. The Lenne valley is still very narrow at Altena, which shares the valley's dominant industry—wire-drawing in brass, iron, and silver. On the watershed between the Hönnne and the Lenne, Iserlohn (32,000 inhabitants) also specializes in needle and brassware, and there are a number of small industrial towns which are also tourist resorts. Finally the Lenne enters the Ruhr at Westofen, where there are steel-cable works and paper-mills. The Hönnne rises near Neunrade, and flows in a somewhat lower and wider valley. Agriculture is therefore more important, though brass is manufactured at points where rapidly flowing tributaries enter—*e.g.*, at Menden. The Hönnne enters the Ruhr at Fröndenberg, which has engineering and paper industries.

The upper Ruhr rises on the north of the Rothaar-Gebirge and flows through the lead- and silver-mining district of Merschede, where the river is dammed to conserve the water-supply for use in the lower Ruhr during the dry season, when

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it is insufficient for the mills. Below Merschede the valley is densely forested. The river-girt castle-town of Arnsberg has paper and chemical industries, and at Neheim there are also iron and non-ferrous metal industries. Near this town the Ruhr is joined by the Rohr and the Möhne, which is also dammed. Less than five miles to the north of the Möhne barrage lies Soest (211,000 inhabitants), the chief market for the upper Ruhr district. The Soester Börde is very fertile, and is an important corn-growing area. An old Hanseatic trading-centre, Soest is near the coalfield, and this has given rise to glass, engineering, and sugar-refining industries.

The Rhenish-Westphalian Industrial Region

The districts which encircle the Rhenish-Westphalian coalfield possessed a fairly well-developed industrial life before the coalfield was opened up, toward the end of the nineteenth century. This relatively late use of the coal allowed the great industries to benefit by the experience gained on other fields. Though there has been a great development of mushroom towns, the industries themselves have been planned in a thoroughly scientific manner, and mines, blast-furnaces, rolling-mills, metal-foundries, glass, salt, and soap works and breweries are all of the most modern type, so that, though the density of population is about 460 persons per square mile, there are few of the great problems of overcrowding which mar the industrial centres of Britain. Though 6,500,000 people live in the industrial region there are many purely agricultural areas where industrial conditions are absent. The agricultural areas—*e.g.*, Soesterland and Münsterland—play a very important part in victualling the purely industrial districts. Sauerland has already been considered, and it has been seen that in the uplands of Westerwald and the Sieg and Lahn valleys there is a very ancient iron industry based on local ores. This has given origin to metallurgical industries, such as wire work and the manufacture of articles of silver, lead, copper, nickel, and aluminium, as well as to hardware and other iron industries

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—*e.g.*, needles and pens. The meadows of the Sieg and the forest of Wittgerstein have been the bases of paper and leather industries at Mülheim, near Cologne. We have also noted the influence of industrial life of the water-power of the headstreams of the Ruhr and Wupper basins.

The Upper Devonian Limestone district lies on the north-western edge of the plateau, and supplies cement and fluxing material for the blast-furnaces. The district lying within the triangle Barmen-Düsseldorf-Mülheim (on Ruhr) is thinly populated and contains no large industrial town. In former times it was employed as sheep pasture, the wool being used in the textile industry of the Wupper valley. The Lower Carboniferous Arnsberger district lies on the north-eastern fringe of the plateau, and the Rohr, Ruhr, and Möhne flow through a district which supplies refractory materials, glass sands and pottery earths. As the water is extremely soft, it is suitable for the dyeing industries of the area, and paper is also manufactured. In the district round Menden there is an outlier of Bunter Sandstone which provides moulding-sands for the local brass industries.

In the Soester Börde, Münster Bucht, and Hellweg Upper Cretaceous rocks are covered in parts by fertile glacial deposits, on which corn and tobacco are grown. This region is the granary of the Ruhr region. In the chalk districts local wool gave rise to textile industries, and cement is manufactured. In the Ravensburg Mulde, however, the textile industry began in connexion with the cultivation of flax. In the Warburge Börde agriculture is very important and sugar-refining and paper-making are carried on.

On the west of the Rhine it has been noted that the Aachen coalfield (page 336) supplies power to local chemical, textile, paper, and small metal industries at Stolberg (glass) and Düren (38,000 inhabitants), which manufactures paper, needles, and felt. Eschweiler has similar industries, its textiles ranging from canvas to ribbons. München-Gladbach (194,000 inhabitants) originated as a Benedictine monastery on one of the headstreams of the Niers. With the use of water-power it became a centre of woollen industries, and now is an important cotton-manufacturing centre, and is

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still the corn market for a fertile district. Krefeld (159,000 inhabitants), at the southern entrance of Gelderland, was a small local market before it came into the hands of the princes of Nassau and Orange in the seventeenth century. These rulers extended their protection to Protestants and Anabaptists expelled from Jülich, Berg, and Cologne. This laid the foundations of the prosperity of its textile industries, and as at this time Amsterdam had become the chief silk port of Europe Krefeld began to develop silk manufactures, which have been retained ever since. Though supported by a small local coalfield, Krefeld is far from the silk ports of the Mediterranean, and the industry has specialized in velours and special fabrics. The quantity of silk consumed is less than at Elberfeld.

Geldern may be compared with Münsterland, but it possesses no chalk outcrop, and is covered throughout by glacial deposits. These are not as uniformly fertile as those of Münsterland, and a great deal of the country was poor woodland and heath until it was drained. In many respects the lower Rhine and Niers valleys resemble Dutch Kempenland, particularly in the afforestation and in the development of pastoral occupations wherever the lowlands can be drained. In the south Geldern (5000 inhabitants) is the principal agricultural market, and manufactures woollens. In the north rye, potatoes, and orchard fruits are grown and marketed at Cleves (10,000 inhabitants). There is a considerable export of fruit.

It is noteworthy that in each of these districts which surround the Ruhr coalfield the industries already in existence before the coalfield was opened up have continued in a specialized form. The textile and metal industries are widespread, and have increased in importance where it has been easy to obtain coal or electrical power transmitted from the coalfield. The textile industries of the upper Wupper and Niers have been specially stimulated by the cheapness of power and by the establishment of a dense population which provides an important local market for their products. Many of the industries now import raw materials from overseas—*e.g.*, iron ore from Sweden and Spain, cotton from the United

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States, and wool from Australia and South America. Everywhere in the coalfield itself the influence of American methods of organization can be seen, and the fine system of railways

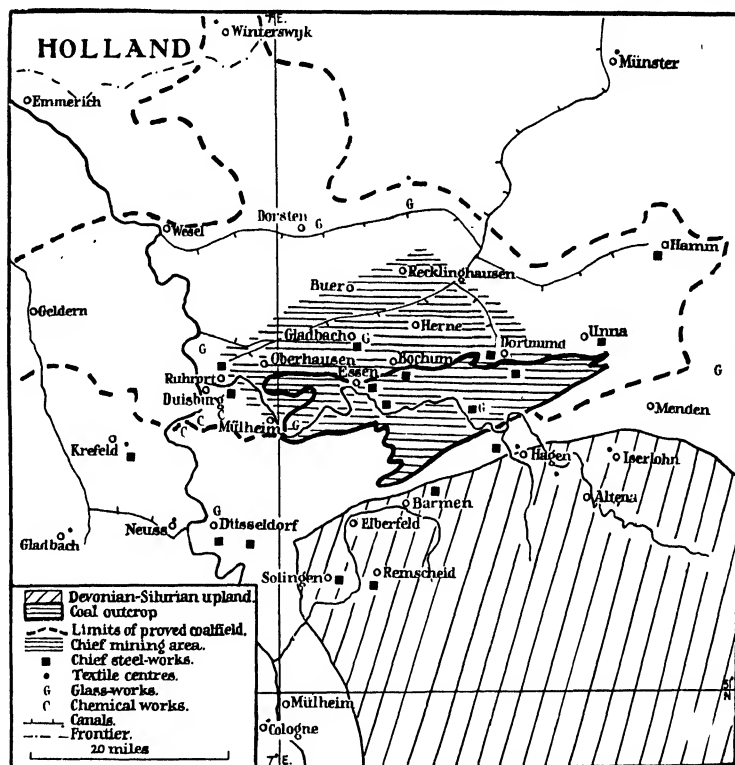


FIG. 67. THE RHENISH-WESTPHALIAN INDUSTRIAL REGION

Timber industries are concentrated near the Rhine ports, while paper is manufactured on the edge of the Sauerland plateau. Zinc-works are found near Hamborn, near Ruhrort, and wire and brass works are localized on the Ruhr headstreams. Practically every town has engineering works—e.g., agricultural machinery is made at Neuss.

and inland waterways is equal in many respects to that of Belgium.

The Rhenish-Westphalian coalfield is the mainspring of German industry, and supplies four-fifths of the power used

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in Germany's mining, manufacture, and trade, besides exporting its surplus coal to other Central European countries. Its great weakness is that it is so near the Franco-Belgian frontier.

The Ruhr Coalfield

(a) *The Coal Outcrop*. The development of the Ruhr coalfield began in the second half of the nineteenth century with the mining of coal and iron in the outcrops which lie in the triangle Elberfeld-Mülheim (Ruhr)-Hörde. As in South Yorkshire and South Wales, the iron industries were localized on the coal outcrop, and the gradual exhaustion of the more easily worked coal seams carried the centre of actual mining northward beyond the outcrop (*cf.* Gelsenkirchen and Doncaster).

While the heavy industries—iron, coke, patent fuel, tar by-products, and steel—were developing the neighbouring industrial regions were stimulated to such an extent that although they possessed some water-power their demand for mechanical power increased far beyond the capacity of local resources. It is not to water-power but to coal that the electrical industry owes its importance. About 1900 the coke-ovens of the Essen district were replaced by the now familiar by-product ovens, from which tar, ammonia (converted into ammonium sulphate), and benzol were obtained, while the waste gases were used for generating electricity (*cf.* the Durham coalfield). Many collieries now produce electricity, and this industry is chiefly carried on between the Ruhr and Lippe rivers, where the coal is concealed by more recent deposits. The power so obtained is transmitted not only throughout the coalfield, but as far as Elberfeld and the towns of the Sauerland plateau. Places as far apart as Hamm and Cologne receive power from the coalfield power-stations.

The Iron and Steel Industry of the Ruhr

The pre-War iron and steel industry of the Ruhr depended on the supply of pig-iron from German and French Lorraine

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and on about 11,000,000 tons of iron ore obtained from other countries. The Treaty of Versailles transferred the Lorraine mines to France, together with the blast-furnaces on which the Ruhr had so largely depended for its supplies of pig-iron. Fresh sources of supply therefore had to be sought in Spain and Sweden, and the blast-furnace industry of the Ruhr had to be reorganized in order to produce a much larger part of the pig-iron needed in the steel industry. In 1913 Germany possessed 204 blast-furnaces (within her present frontiers), and these produced nearly 16,500,000 tons of pig-iron. In 1927 there were only 116 blast-furnaces, but as these were of larger capacity the output of pig-iron was more than 13,000,000 tons. This means that with fewer furnaces Germany is now producing almost as much pig-iron as before the War. In the Ruhr the amount of pig-iron produced is now greater than in 1913. The hæmatite ores of the Westerwald and the Sieg and Lahn valleys are supplemented by large amounts from Sweden, Spain, Normandy, and Newfoundland.

For the steel industry, however, it is now necessary for Germany to import iron and steel in a partly manufactured form, and steel sections, bars, and hoops are imported in exchange for a considerable export of coke. The amount of pig-iron which Germany may obtain from Lorraine is controlled by the European Steel Cartel. It should be noted that France annually produces about 35,000,000 tons of ore, of which 22,000,000 tons are consumed in French blast-furnaces and 9,000,000 tons exported (7,500,000 tons to Luxemburg). As her steel industry has doubled its output since 1919, France has little pig-iron to spare for Germany. Nevertheless, in spite of lack of ores and of iron from Lorraine the German steel industry has made a remarkable recovery. The steel output of Rhenish Westphalia is now equal to that of 1913, 10,000,000 tons. It is clear, therefore, that the loss of Lorraine, Luxemburg, the Saar, and Polish Upper Silesia has had the effect of increasing the industrial concentration of the heavy iron industries of the Ruhr coal-field. Iron- and steel-works, salt and glass industries, are found in Hattingen, Hörde, Schwerte (nickel), Wattenscheid,

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Unna, Werden, and Witten, but the chief industrial centres are Bochum, Dortmund, and Essen.

Dortmund (525,000 inhabitants), a former Hanseatic and



FIG. 68. DORTMUND STEEL-WORKS

The illustration shows a large crank-shaft under a 2000-ton press.

By courtesy of the German State Railways

Imperial city, has developed an enormous traffic in coal, sand, colonial produce, corn, and flour in consequence of its being the terminus of the Dortmund-Ems Canal, which

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affords access to the Rhine-Herne and Lippe canals, and thus with the Rhine and Rotterdam. Being a great inland port, it is able to specialize in the manufacture of heavy bridges, machinery, locomotives, and stationary boilers. Its trade consists of its manufactures and the distribution of coal, grain, leather, petroleum, fodder, and foodstuffs. The total tonnage of its port annually amounts to more than a million tons. Bochum (313,000 inhabitants) is more characteristic of the south of the industrial region in having no navigable waterway. It lies midway between Dortmund and Essen in a district which produces annually about 24,000,000 tons of coal. Railways radiate from it to all parts of the industrial region, and though it lies on the outcrop it is practically the centre of the mining region, iron being mined as well as coal. It has the greatest mining school in the world, and manufactures steel, machinery, chemicals, electrical apparatus, motor-cars, and other kinds of mechanical equipment, as well as tobacco, beer, and leather goods. Essen (629,000 inhabitants), which was a small town of 3500 people at the beginning of the nineteenth century, lies midway between the unnavigable Ruhr and Emscher streams. It is the most typical as well as the greatest example of German industrial development, for it is the outcome of deliberate organization, and not of exceptional geographical advantages. It is linked by road and rail with Stelle, below which the Ruhr is navigable. Like many of the other small towns of the Ruhr valley, it formerly possessed a number of minor domestic industries—*e.g.*, linen and woollen cloth and leather. The rise of Essen was due to the breaking down of the internal customs frontiers of Germany, to the discovery of the Thomas-Gilchrist method of utilizing phosphoric iron ores, and, above all, to the genius for industrial organization possessed by the founders of the Krupp works. Its great steel-works are linked up with numerous industries in Dortmund, Neuwied, Engers, Magdeburg, Dresden, Duisburg, Bochum, and Nuremberg. It was one of the first towns in Germany to adopt the new by-product type of coke-ovens and to use the waste gases of its blast-furnaces and steel-works for the generation of

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electrical power. It has a world-market for its products, and even when it was handicapped by the necessity of converting its ordnance works for peace-time production it still retained its lead in the machinery, tool, and hardware industries. It has important timber-mills and chemical-works. Mülheim (129,000 inhabitants) is the port of the Ruhr river, but it is chiefly important for the manufacture of steel, glass, paper, and leather.

(b) *The Concealed Coalfield.* North of the line joining Mülheim, Essen, and Dortmund the coal seams dip under more recent deposits, and it is in this area that the bulk of the coal output is mined. The valley of the little Emscher river has been used for the construction of the Rhine-Herne Canal, which connects Datteln, in the Lippe valley, with the Lippe-Seiten and Dortmund-Ems canals. Throughout this district coal is more important than the manufacture of iron and steel.

The Lippe valley is agricultural country where industrial development is far from complete, and it is only in the parts served by railways and canals that coal is mined. There are a number of mines on each side of the Lippe, and the iron-foundries and heavy industries connected with steel constructional work, such as bridges and cables, are chiefly found at Hamm (50,000 inhabitants), the terminus of the Lippe-Seiten Canal. Even here the manufacture of starch, leather, and varnish is almost as important as the industries connected with copper and iron. In each of the Lippe Canal ports there are sawmills and copper-works. Lünen (26,000 inhabitants) manufactures metal goods, glass, and prepares sawn timber, and is a coal-port. Datteln, where the Dortmund-Ems and Lippe canals join, exports coal. At Haltern the Steyer enters the Lippe, and electrical power is obtained from Recklinghausen for the cotton-spinning industry. Up to the present no coal-mines have been opened in this district, but farther west, toward the mouth of the Lippe, there are several mines near Dorsten (8500 inhabitants). Originally an old Franciscan monastery, this town already exports coal and has developed machine, glass, and sawmilling industries. As there is a large area of workable coal immediately

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to the north, it is probable that Dorsten will become an important coal-port. At Wesel (22,000 inhabitants) both the Lippe and the Rhine are bridged. Though connected with a number of coal-mines by rail Wesel has not yet developed heavy iron industries, and its people are engaged in occupations characteristic of Geldern and Holland, cement and tiles being made and sugar refined.

The Emscher valley is one of the busiest thoroughfares in the world, with traffic along the river, the Rhine-Herne Canal, and the maze of railway lines. Recklinghausen (with suburbs 120,000 inhabitants) is the centre of the northern mines and exports its coal by rail as well as by canal. It makes iron and cement, and has machine-works and saw-mills. Buer (110,000 inhabitants) lies midway between the Emscher and the Lippe, and is connected by rail with the Rhine ports of the Ruhr. Like Gladbach, it has mines, and there is a sawmill industry in the latter town. In the same neighbourhood there are carpet-works, while cotton-thread and bleaching industries are carried on at Herrlichkeit-Lembech.

Herne (91,000 inhabitants), Wanne-Eickel (91,000 inhabitants), and Gelsenkirchen (209,000 inhabitants) form what is practically one town at the head of the Rhine-Herne Canal, and serve the greatest colliery area in Continental Europe. Their docks extend for miles along the canal-bank, and more than 10,000,000 tons of coal are produced every year. Five and a half million tons are exported from Wanne-Eickel alone, and large quantities are sent by rail to all parts of Germany and to the Rhine ports. Gelsenkirchen has cold-storage facilities and acts as the centre for the distribution of foodstuffs and electrical power to the most densely populated parts of the industrial area. Iron and steel industries, the refining of metals, and the production of hardware and steel articles make it one of the greatest industrial centres in Europe. Bottrop (82,000 inhabitants) is the second great canal-port, and uses local deposits of sand in the manufacture of firebricks. Oberhausen (186,000 inhabitants) lies between the Rhine-Herne Canal and the Ruhr, and is continuous with Meiderich and Hamborn (133,000 inhabitants).

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This group of towns combines the dominant coal and iron industries with the manufacture of zinc, lead, glass, and chemicals, the waste gases being used for the production of electrical power on a large scale. The Ruhr coalfield is still an area of immigration, and there is a large number of foreigners working in the mines—*e.g.*, Poles form 21 per cent. of the population of Recklinghausen and 17 per cent. of that of Hamborn. In the Wesel district there are a number of Dutchmen. The annual output of coal in Rhenish Westphalia is about 112,000,000 tons. The greater part of this is consumed in Germany, about 27,000,000 tons of coke are produced, and between 20,000,000 and 30,000,000 tons of coal exported to foreign countries, chiefly through Duisburg (see page 356).

The Rhine Waterway

The Rhine rises in the Swiss Alps (see page 260) and enters Germany at Basel, when it begins to flow northward into the Rift Valley. At Bingen the river again changes its course, and enters the Rhine gorge, from which it emerges into the lower Rhine plain, near Bonn. At the Dutch frontier the Rhine divides, the mainstream flowing through Nimegen to Rotterdam. The second distributary again divides near Arnhem into the Lek and the Yssel, which break into smaller rivers before reaching the sea. Though the river flows throughout in a region where precipitation occurs at all seasons the upper Rhine is liable to floods in spring when the snow melts and in early summer when the glacier-water comes down from the Alps. In late summer and early autumn the river-level above Strasbourg is low and navigation impeded. Below Mannheim there is always sufficient water for large barges, though navigation is rendered difficult by river ice and fog in winter.

During the high-water season of spring there is a minimum depth of six feet up to Basel, the limit of navigation. There is little traffic above Basel because of the strength of the current, and in the section between Basel and Strasbourg the speed of the current makes upstream traffic both expensive and slow, especially during late spring and early sum-

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mer. During the late summer the level of the Rhine above Strasbourg is low. Basel can be reached on an average of only 180 days during the year. The period during which this section of the river is open for navigation varies, and much traffic is carried by rail which would be carried by water if regular services could be maintained. The tonnage of the port of Basel varies a good deal. In 1903, when new river services were established, only 300 tons entered Basel, but the tonnage rapidly increased till 1924, when more than a quarter of a million tons were cleared. In 1925 the river traffic of Basel fell to less than 90,000 tons because the river was unusually low, navigation being open for only 120 days. In 1927 three-quarters of a million tons were handled, and the construction of the new Canal d'Alsace should make Basel an important port. Moreover, Germany has expressed a desire to have the river regulated as far as Lake Constance.

The minimum low-water depth of the Rhine is about three and a half feet above and six and a half feet below Germersheim, which lies about half-way between Mannheim and the border of Alsace. Moreover, the current at Lauterburg, on the Alsatian frontier, is considerably greater than at Ludwigshafen. As the low-water period extends from September to March, traffic above the twin ports of Ludwigshafen-Mannheim is liable to interruption. Below them traffic is continuous, though fogs and floods occasionally cause delay. Floating ice is seldom troublesome. The low-water season has prevented the continuation southward of the great stream of traffic which gives Mannheim its exceptional importance.

The Treaty of Versailles compelled Germany to cede Strasbourg to France and to supply the vessels needed to build up Belgian and French merchant fleets on the Rhine. France was allotted about 5,000,000 tons of the total shipping trade, which had amounted to 57,500,000 tons in 1913. Out of a total of 22,000,000 of barge tonnage France received 250,000 tons, together with tugs, dock accommodation, and warehouses in Mannheim, Duisburg, and Rotterdam. Belgium received 150,000 of barge tonnage and the right to construct a ship canal between Antwerp and Ruhrort, a

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right which would have been exercised were it not that Holland feared the loss of trade to Rotterdam and refused to allow the projected canal to cross Dutch Limburg. Moreover, although governed by an international commission, the hydro-electric power of the Rhine between Basel and Strasbourg has been given to France, thus robbing Baden of nearly half a million potential horse-power, an amount equivalent to that which could be developed from the coal output of the Saar basin. The following figures seem to indicate that Strasbourg is gaining trade at the expense of Ludwigshafen-Mannheim:

TONNAGE OF THE PORTS OF THE UPPER RHINE
(IN THOUSANDS OF TONS)

	1912-13	1922	1927
Mannheim . . .	8165	9900	9091
Strasbourg . . .	1988	1905	4331

Hitherto the effective limit of navigation has been Strasbourg-Kehl. The Kehl docks open directly into the Rhine, and this port will probably become an important distributing centre for Baden and South Germany. Land at Kehl is cheap, and there is a large area suitable for dock construction if the demand arises. Kehl has a capacity for a million tons of cargo (*cf.* Strasbourg, 4,000,000 tons).

The upstream traffic is chiefly coal and petroleum, while the downstream cargoes consist of potash, timber, and building materials, iron ore and grain. Most of the vessels using the upper Rhine belong either to Germany or to Holland, though there are considerable numbers of French, Belgian, and Swiss vessels in the section above Mainz and there are at least two vessels flying the flag of Luxemburg.

The Neckar has been canalized for vessels of 1200 tons as far as Heilbronn, the limit of steamer navigation. The total traffic of the Neckar is about 140,000 tons, and consists chiefly of timber downstream and of coal and grain upstream. Mannheim and Ludwigshafen can be reached by ocean-going vessels, though most of the cargoes are brought by large Rhine barges which return empty or with occasional cargoes of timber, chemicals, ores, asphalt, or gravel. These ports

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receive 5,250,000 tons of coal from the Ruhr and 2,700,000 tons of grain and petroleum from Holland. Their total outgoing traffic is less than 2,000,000 tons. More than 600,000 tons of timber and chemicals go downstream to Holland and 1,250,000 tons of coal, petroleum, and grain upstream to Strasbourg. Mannheim's distributing trade by railway is shared by Karlsruhe, the tobacco market of Baden, and Mainz, the port of the Main valley.

The Main is navigable for small boats as far as Bamberg, where the Main-Danube Canal gives through communication with the Danube (see page 317). Würzburg is the limit of barge navigation, and has a timber-floating association. Below Aschaffenburg the Main has been canalized, and 1500-ton barges can reach Frankfort (1,300,000 tons by river and 23,000,000 tons by rail). There is little through traffic between the Rhine and the Danube, but the reconstruction of the Ludwig Canal would be reflected in the increased importance of the port of Frankfort, where more than four-fifths of the traffic is at present upstream. Mainz, whose imports (2,140,000 tons) and exports (370,000 tons) by river are far less than its rail traffic (10,500,000 tons), would also benefit. The Nahe, on the left, is navigable for small steamers as far as Kreuznach, which has a trade in salt, leather, and woollens, but there is practically no traffic on this river. Bingen, at the mouth of the Nahe and the entrance to the Rhine gorge, was of considerable importance during the Middle Ages, and still retains a certain amount of commercial traffic by water, though it is chiefly important as a tourist centre.

The bulk of the Rhine traffic increases below Coblenz (58,000 inhabitants), the capital of Rhenish Prussia, at the mouth of the Moselle. Coblenz is a local market for agricultural produce and wine, and manufactures pianos, paper, and cotton and woollen goods. Its commercial importance, however, cannot be compared with that of Mannheim because the Moselle is not navigable for large barges, though a little iron ore is sometimes brought down from Lorraine. If the Moselle were canalized it would be possible for it to carry large quantities of iron ore, coke, and iron, and Coblenz would

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become an important port. The Ahr is not navigable for large barges, and neither Sinzig nor Linz, at the junction with the Rhine, are important. Their chief trade is in timber and wine. The Sieg river is not navigable above Siegburg, but near its junction with the Rhine the gorge opens out. Throughout the Rhine trench between Bingen and Coblenz the steep slopes are lined with vineyards and carry a population of about 800 people per square mile. Below Coblenz the Rhine valley begins to widen, the area of cultivable land near the river is greater, and the population increases to more than 1000 persons per square mile. Bonn (90,000 inhabitants) lies amid fertile country and is the first great bridge-town below the gorge. The bridge gave rise to its medieval importance, though it had previously been chosen as a site for one of the Roman fortresses along the river. An ecclesiastical and military centre of considerable importance, it suffered heavily in religious wars and during the campaigns of the early eighteenth century. With the defeat of Napoleon Bonn lost its military importance and began to develop manufactures. These now include the making of jute, cotton, and silk goods, pottery, and scientific instruments. Its patent-fuel industry, which supplies industrial power, is based on local lignite-fields, and it has become the outlet of the iron ore of the Sieg valley. Its university was founded more than a century ago.

Cologne, or Köln (700,000 inhabitants), originated as a Roman fortress commanding the lowest convenient crossing for large bodies of troops. Its command of the routes across the plain to Belgium and Germany made it the great distributing centre of the lower Rhine and Netherlands. It therefore became the terminus of the overland routes from Italy, Burgundy, and the Danube and the exchange centre of the products of the North and Baltic Seas. In association with Lübeck it became the southern headquarters of the Hanseatic federation, with factories throughout Western Europe. Being the centre of a prince-bishopric it expelled Protestant workmen, who in 1608 carried their industries to Krefeld, Düsseldorf, and Elberfeld. During the wars of the Reformation the Rhine mouth was blockaded by the Dutch, and

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Cologne lost its overseas trade. Peace with Holland brought back some of its commerce, and it is still a port for small ocean-going vessels. Its dominance of the commerce and

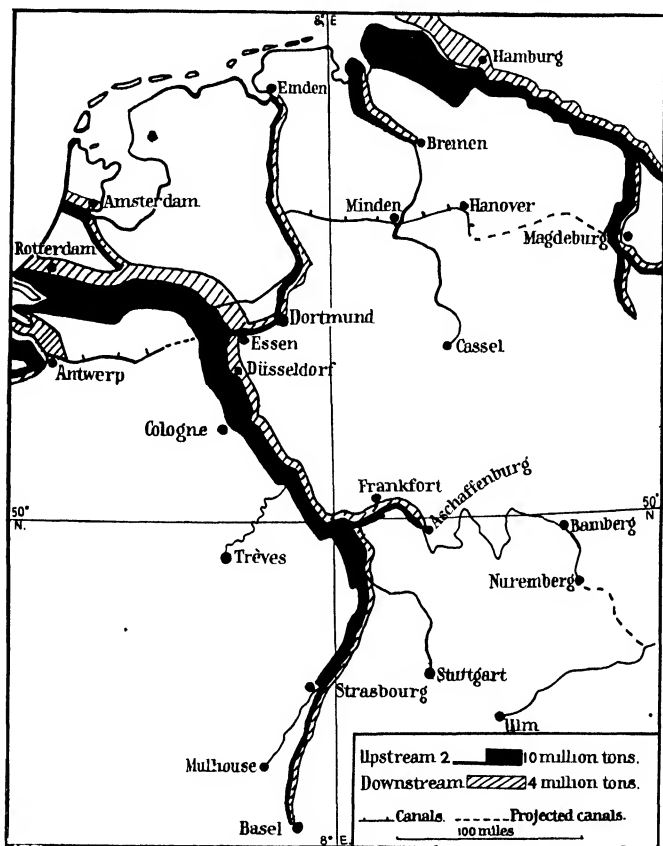


FIG. 69. DIAGRAM TO ILLUSTRATE TRAFFIC ON THE RHINE

industry of the Rhine valley, however, has been lost, though it remains the greatest town of the lower plain of the Rhine. The opening up of the Rhenish-Westphalian coalfield provided it with cheap power for its steel, shipbuilding, machinery, cotton, rubber, patent-fuel, glass, chocolate, and tobacco

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industries, while it is able to supplement the power obtained from imported fuel by electricity derived from a local deposit of lignite. Though Cologne has 2,500,000 tons of river traffic it is chiefly important as the greatest railway centre of Western Germany, and handles 58,000,000 tons of rail-borne traffic annually.

Düsseldorf (464,000 inhabitants), where the Düssel stream enters the Rhine, was originally a small Rhine town, the residence of the Dukes of Berg, and later of the Princes Palatine. As such it became a flourishing art centre, and was also noted for small woollen industries—*e.g.*, carpets and hosiery—and later on for chemicals, starch, and vinegar. Its modern development dates from the construction of a railway bridge across the Rhine in 1873, and since that time its population has increased fivefold. It lies outside the coalfield, and developed because it was the lowest bridge-town on the Rhine, giving railway communications westward into Belgium and Holland and eastward into the heart of Germany. Chosen by the organizers of the Ruhr steel industries as their marketing centre (*cf.* Birmingham), it has become important for machinery, railway material, and small metal industries. Its distributing facilities have increased the importance of its chemical industries, which now include the manufacture of dyes, lac, varnish, and glass, as well as fertilizers. Its textile industries have been brought up to date, and it has developed a considerable shipping trade (600,000 tons being imported and 135,000 tons exported). Neuss (45,000 inhabitants), on the Erft river, which enters the Rhine a short distance above Düsseldorf, is connected with the Rhine opposite Düsseldorf by means of a short canal, which enables it to maintain direct river services. Like Düsseldorf, it has woollen, cotton, leather, timber, paper, and starch industries. It also shares in the steel industry and manufactures refined sugar and tobacco. It is the petroleum port for the Aachen district.

At Duisburg-Ruhrort (421,000 inhabitants), where the Ruhr enters the Rhine, is the largest inland-water port of the world, with a tonnage of about 24,000,000 in 1928. It is responsible for nearly 60 per cent. of Germany's export

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of coal, and has cotton, tobacco, dye, chemical, and zinc industries. The busiest stretch of water in Europe lies between Duisburg and Rotterdam; the upstream traffic consists of bulk cargoes carried in barges and sea-going steamers. It is impossible to find sufficient bulk cargoes of coal, coke, stone, cement, and manufactured iron to provide an equal amount of downstream traffic, and many of the ships return in ballast. The German frontier port is Emmerich, but most of the vessels do not stop until they reach either Rotterdam or Antwerp. Rotterdam (page 255) is the finest example of a river sea-port in the world, and is responsible for the transit of cargo in bulk to the Rhineland provinces and the Westphalian industrial region. As the value of the manufactured articles produced in the industrial districts is much greater than that of the imported raw materials, the exports are able to travel by rail, and are often sent to Antwerp (page 206), where they are collected into general cargoes. Thus, though 90 per cent. of the total inland traffic of Rotterdam is carried by river, 65 per cent. of the inland traffic of Antwerp is carried by rail, and there is no possibility of balancing the import and export tonnage of Rotterdam. In order to increase the importance of the transit of bulk cargoes from Antwerp France has given Belgium preferential treatment at Strasbourg, and towage charges have been paid in order to enable Antwerp to compete with Rotterdam. Moreover, the low exchange value of Belgian currency has enabled the Belgians to offer lower rates than were possible through the Dutch port. By 1927 Antwerp had more than 4,000,000 tons of its traffic on the Rhine, and sent 700,000 tons of wheat, maize, and Saigon rice to Strasbourg, receiving in exchange nearly 500,000 tons of potash and French manufactures. For a time Antwerp became the chief port of Europe, but as the Dutch have now offered preferential tariffs for cargoes intended for German harbours in exchange for the withdrawal of specially low railway rates on goods carried from Germany to Antwerp the volume of German traffic through Rotterdam is steadily increasing. (For the course of the Rhine through Holland see pages 255-256.)

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TONNAGE OF THE GERMAN RHINE PORTS IN 1928 (IN THOUSANDS OF TONS)

Port	Internal Traffic		Foreign Traffic		Total Water-borne Traffic
	In	Out	In	Out	
Duisburg . .	3,582	1,741	13,292	5,222	23,837
Köln . .	967	540	362	719	2,588
Mainz . .	—	—	—	—	1,500
Speyer . .	—	—	—	—	70
Frankenthal .	—	—	—	—	40
Ludwigshafen-Mannheim .	676	5,246	1,256	2,715	9,893

The total German traffic on the Rhine in 1928 was 77,107,000 tons.

The Rhine in History

Throughout historical times the Rhine has been one of the main north and south routes through Central Europe, but except between Bonn and Cologne and near Basel its valley has been a barrier to traffic from east and west. Above Bonn the Rhine passes through a barren highland district, which in former ages could only be crossed with difficulty by large groups of people. It was within this highland region that the Franks found refuge at the close of the Roman period and consolidated their power during the eighth and ninth centuries. The river was both a thoroughfare and a frontier, to the east of which lived tribes untouched by the religion and law of the Roman Empire. Both Roman and Irish missionaries settled among the Franks, and there gradually grew up a regular pilgrimage route along the Rhine from North-west Europe to Rome.

As the demand for Mediterranean and Eastern products increased the Rhine became an important commercial highway across the Alpine barrier, and the old Roman outposts Augst, Strasbourg, Mainz, Coblenz, and Cologne continued to exist as important towns. With the growth of feudalism,

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however, there also arose a number of castles whose rulers exacted tribute from the traders who used the river. This tended to restrict the growth of river-borne commerce. Late in the Middle Ages the Swiss mountaineers won their independence, and their city-states became centres from which Protestant doctrines spread throughout North-west Europe. The Germans had never been completely Romanized, and the Reformation revealed the Rhine as a great frontier zone. The close of the wars of religion found the Rhine states hopelessly divided among a number of petty rulers, some Roman Catholic and some Protestant, and it was not until the French overran the valley in the seventeenth and eighteenth centuries that these little states were extinguished and the way was cleared for the freer development of modern commerce. The Rhine then became the frontier between France and Germany, though each has claimed that the whole of the valley was theirs by right and by tradition. It was because of this deep-rooted hostility that the Rhine was declared an international waterway at the close of the World War.

IV. THE EASTERN UPLANDS OF GERMANY

1. The Erzgebirge and Saxony

(a) The **Erzgebirge** is a plateau region which rises more than 3000 feet above sea-level. Above 3000 feet the upland is covered with moors, while below that height is a zone of forests, 30 per cent. of the total area being woodland. Between 2000 and 3000 feet there are a number of small clearings, with rye, potatoes, and oats. The water-power and the minerals of this north-western part of the crystalline block of Bohemia have given rise to (i) metal industries, including the production of silver, tin, cobalt, copper, and nickel ware, and (ii) household spinning of linen yarn and the manufacture of lace. The Fichtelgebirge and the Erzgebirge are drained by the Elster, Pleisse, and the Zwickau and Freiburg tributaries of the Mulde.

The Elster Valley. The Elster rises in the south-west of the Erzgebirge and flows through the oak woodlands of the

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Vogtland. Lumbering, however, is not important since the headstreams of the Elster and Saale are not navigable. Their water is soft and is used in dyeing as well as for power. The textile centres are Ölsnitz (18,000 inhabitants), which manufactures woollen upholstery and dyes, using the water of the Elster, Auerbach (16,000 inhabitants), Falkenstein (19,000 inhabitants), and Reichenbach (30,000 inhabitants), on the Goltasch, manufacturing curtains. Plauen (111,000 inhabitants), on the Elster, is the principal manufacturing centre for machine and home-made lace and fine brass work. Greiz (37,000 inhabitants), at the junction of the Goltasch and the Elster, also manufactures woollens and dyes. Gera (81,000 inhabitants) and Zeitz (37,000 inhabitants) have important dyeing industries.

The Pleisse Valley. The Pleisse rises in the Saxon coal-field, and is highly industrialized throughout its course. Neunkirchen manufactures musical instruments, an industry which is found throughout the Erzgebirge. Crimmitschau (27,000 inhabitants) shares in the glove, cotton-spinning, -weaving, and -dyeing industries of the Zwickau Mulde. Altenburg (43,000 inhabitants) manufactures toys, shoes, and gloves.

The Mulde Basin

The Zwickau Mulde rises near the source of the Elster, in the south-west of the Erzgebirge, and the Schwarzwasser crosses the German frontier at Johannegeorgenstadt, which manufactures gloves. The two streams unite at Aue (24,000 inhabitants), which manufactures ironware and tinware. This district was one of the original centres of the tinplate industry, the secret of its manufacture having been carried there from the Black Forest by a refugee from religious persecution. The Zwickau Mulde flows over lower coal measures through an iron- and textile-manufacturing district. Zwickau (81,000 inhabitants) is the chief centre of the Saxon coalfield, with an output of about 3,000,000 tons per annum, and manufactures textile machinery as well as cotton goods. Meerane, Glauchau, and Schneeberg also manufacture cotton yarn and cloth, dyes, gloves, and machinery.

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The Chemnitz river is joined by the Wutschnitz and Zwönitz streams, and the water-power possessed by the district gave rise to early linen and woollen manufactures. It has become one of the principal cotton-hosiery manufacturing centres on the continent of Europe since the surrounding coalfields have been opened up. The population of the Saxon coal-field is very dense—1,200 persons per square mile—cotton, machines, and furniture being the chief manufactures.

The Zchopau river has a number of headstreams in the Fichtelgebirge, and has a rapid fall to Annaberg (19,000 inhabitants), which manufactures metal, linen yarn, and lace. As in several other districts, the local toy industry originated in the long periods of winter idleness, and a handwork industry is carried on by means of a division of labour.

The Freiburg Mulde rises in the north-east of the Erzgebirge, the power being concentrated in Freiburg (34,000 inhabitants), which possesses magnetic iron ore resources. In the east of the mountains straw plait is made by the peasants. In Freiburg there are chemical, paper, cotton, linen, and tinplate industries, and the timber of the neighbourhood is used for the production of furniture, toys, and musical instruments. Döbeln (22,000 inhabitants), near the junction of the Zchopau and the Freiburg Mulde at a point where an island in the river facilitated the construction of a bridge, is an important railway junction, with cotton, woollen, and linen mills.

The lower Mulde flows into the Elbe plain, and will be considered as part of the industrial region of Saxony and the Elbe plain. Saxon Switzerland is the northern part of the Erzgebirge, and comprises the country on both sides of the Elbe gorge. Its upland slopes are covered with oak-forests, and there is a considerable traffic in timber and sandstone on the Elbe at this point. In 1913 nearly 3,500,000 tons of cargo passed through the gorge. In 1922 the river traffic had begun to recover, and nearly 600,000 tons of cargo went downstream. Of this 204,000 originated in Czecho-Slovakia. During the Middle Ages Königstein, where the Biela river enters the Elbe, was the castle-town commanding the gorge, but the present frontier port is Pirna (31,000 inhabitants),

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where the Seederitz, Zehist, and Gottleuba valleys converge on the Elbe. This town serves as a distributing centre for petroleum and manufactures iron and enamelled goods. The chief tributaries on the east of the Elbe at this point are the Sebnitz and the Kirnitsch. Sebnitz is the manufacturing town and Schandau the Elbe port of the Sebnitz valley. Both places are picturesque tourist centres.

Dresden (619,000 inhabitants) is the capital of Saxony because of its command of the routes between Silesia, Saxony, and Bohemia. The Weiseritz valley, which lies immediately to the west of the town, is underlaid by coal, the chief mining centre being Döhlen. The coalfield has given rise to considerable industrial development, woollens, linens, silks, and carpets being made, while its position near the outlet of Czecho-Slovakia's river-borne exports has given rise to sugar-refining and brewing. Its river traffic amounts to 331,000 tons annually (two-thirds coming from downstream). With the exception of porcelain and straw-plait, the other industries—the manufacture of scientific instruments, machinery, jewellery, photographic apparatus, and chocolate—are those of a large administrative centre, and might have been established in any large town possessing good communications and a surplus of skilled labour. On the other hand the development of railways has left Dresden somewhat out of the main route from east to west, and Leipzig is the central point for the traffic of the lowlands. Meissen (45,000 inhabitants) owes its importance to local deposits of kaolin derived from the porphyry of intrusive igneous rocks. It is a very important centre of porcelain manufacture.

(b) **The Saxon Plain and the Middle Elbe.** Down to the 400-foot contour none of the rivers of the Erzgebirge is navigable, but as the slopes of the German side of the Erzgebirge are much more gentle than those in Czecho-Slovakia railway construction has been easy, and there is a fine network of railways. The Saxon industrial region owes its industries to (i) its local supplies of raw materials—timber, limestone, mineral ores, salt, kaolin, glass sands, and wool fleece, (ii) its lignite, coal, and water-power resources, and (iii) the natural fertility of the lowland areas, where there

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are considerable tracts of glacial and loess soils. As a result, the triangle Dresden-Halle-Chemnitz is one of the most densely peopled regions in Europe.

The lower valleys of the Mulde, Pleisse, Elster, and Saale have very large deposits of lignite, and in the neighbourhood of Halle there is a small coalfield. To the west of the Saale

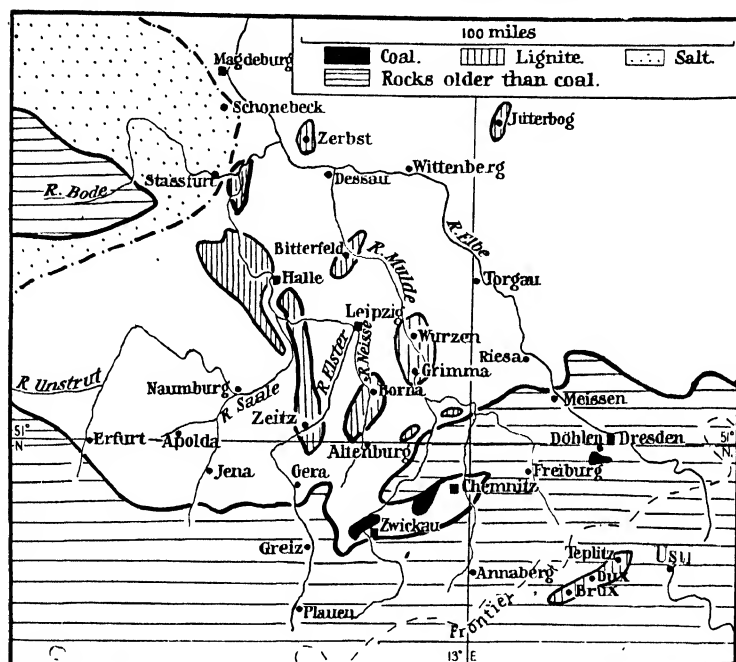


FIG. 70. INDUSTRIAL REGION OF SAXONY

stretches the Triassic salt-field, which possesses valuable potash in the neighbourhood of Stassfurt and Schönebeck. Reference has already been made to the boot, glove, and toy industries of Altenburg, where the Pleisse leaves the Triassic rocks. At Grimma (11,000 inhabitants) the Mulde enters a large lignite-field with an output of 600,000 tons per annum, used in the local machine industries. Wurzen (19,000 inhabitants), at the northern end of the lignite-field, manufactures

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paper, while Riesa (11,000 inhabitants), where the Elbe enters the North German plain, possesses both timber and iron industries. Throughout these districts brewing, flour-milling, tanning, and sugar-refining are important.

Leipzig (679,000 inhabitants) was originally a fishing village at the limit of navigation of the Elster. It lies between the pastures of the plains and the forests of the hills, its name being derived from the Slavonic "Lipzk," the town of the lime-trees. Like many similarly situated places, it developed timber and leather industries, while its position at the junction of routes and the Imperial patronage with which it was favoured at the beginning of the sixteenth century made its wool fairs the most important in Saxony. With the improvement of roads, and at a later date with the construction of railways, it became the chief link between the east of the European plain and the valleys of the Weser and Main, so that its fairs increased in importance. Its early start in printing made it the greatest book-manufacturing and -distributing centre, leather being used for bindings and wood for type. With the change to metal type the existence of copper, lead, zinc, and tin industries in the Harz and Erzgebirge enabled it to retain its lead in printing, the forests providing paper. Out of this machine industry it developed the manufacture of scientific and musical instruments, while its distributing facilities attracted a trade in woollen, cotton, silk, and fur articles. Surrounding it are districts producing glass sands, salt, lignite, and coal. It therefore became a great market for glass, pottery, machinery, jewellery, hardware, and chemicals, and it developed machinery, clothing, chocolate, starch, and soap industries.

The Saale provides the principal line of communication between Nuremberg and Berlin, and is densely populated and highly industrialized. Nevertheless, its countryside is unspoiled, and very large areas are under hay and fodder crops, while in the towns the ox-wagon is to be found almost as frequently as the motor-car. The limits of medieval navigation commanding routes across Thuringia have become important towns. Halle (194,000 inhabitants), near the confluence of the Elster and the Saale, rose to importance

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as a salt centre, one of the branches of the river being kept open for navigation. This made it grow as an agricultural centre, with manufactures of agricultural machinery, starch, and sugar, the latter attracting cocoa and chocolate manufactures during the nineteenth century. The local salt, coal, and lignite deposits have given rise to chemical, patent-fuel, and oil-refining industries, and there are paper, leather, and wagon works. In spite of its having become a great centre of brown-coal industries it retains many of its seventeenth-century buildings, and remains an important educational centre. At present its metal industries are those concerned with the local mines, paper-mills, sugar-refineries and farms, but it is probable that with the construction of a canal from Leipzig to Halle, Magdeburg, and Peine, where it will join the Midland and Brandenburg canals, it will begin to develop manufactures using bulkier raw materials than can be carried in the small barges at present employed on the Saale river.

The lignite of Saxony has briquetting qualities which have made Halle the greatest centre of patent-fuel manufacture in the world. At first briquettes were used only for domestic purposes, but improvements in manufacturing methods made it possible for patent fuel to be used for a large number of industrial purposes. Each year Germany manufactures about 35,000,000 tons of patent fuel, and during the War the aluminium industry was transferred to the lignite-fields, which offered extremely cheap power. Bitterfeld, on the Mulde, is one of the three centres which have retained this industry, but its power is derived in part from the hydro-electric power-station at Döbeln. Bitterfeld also manufactures woollen cloth and earthenware pipes. Dessau (71,000 inhabitants), at the junction of the Mulde and the Elbe, is an agricultural market, and manufactures woollens, chemicals, and leather. It is an important Elbe port. Wittenberg (23,000 inhabitants), where the Nuremberg-Berlin railway crosses the Elbe, was the residence of the Electors of Saxony and the centre of Luther's propaganda, and remains a great theological centre at the present day. Bernburg (34,000 inhabitants) lies near the outlet of the Bode river, which drains

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the Stassfurt area. Like the other towns on the Saale, it manufactures pottery, starch, and paper. The towns of the Elbe are outlets for the corn, cattle, and vegetables of the Saxon plain, and often possess sugar-refining, iron, textile, and fertilizer industries, which serve the needs of local agriculture.

2. The Sudetes and Silesia

(a) **The Sudetes.** The upper Lausitz region is drained by the Schwarz Elster and the upper Spree, and resembles the Erzgebirge in possessing forests which occupy 29 per cent. of the area and pastures. Coal and lignite are found, but its industrial and commercial life is not highly developed because the Spree is not navigable above Lüben. The Lausitz lignite area supports a number of industrial towns near the Bohemian frontier (*cf.* the Warnsdorf-Reichenburg (Liberec) district of Czecho-Slovakia). Local fruits are used for the jam manufacture of Bautzen (41,000 inhabitants), a medieval castle-town near the source of the Spree. Metal goods, paper, and tobacco are also manufactured in the same district. Zittau (38,000 inhabitants), on the Neisse below Liberec and Gablonz, is the centre of the lignite-field, and supplies Liberec and Warnsdorf with fuel for their linen and jute industries. Mountain pastures, forests, water-power, or lignite are the bases of the textile industry of Görlitz (92,000 inhabitants), on the Neisse, the only large industrial centre of the Lausitz district, with iron and steel and linen and woollen industries.

The *Riesengebirge* and the *Waldenburg coalfield* are drained by the Bober, Katzbach, and Weistritz rivers. In this area the industrial life is definitely based on local pastures and forests, Landeshut making leather, linen, and cotton, while Hirschberg manufactures porcelain and wood-pulp. On the Katzbach Freiburg manufactures clocks as well as linen, but the only important town is Liegnitz (73,000 inhabitants), the chief market of the Katzbach basin. Here distilling, sugar-refining, and flour-milling are carried on, and the abundance of local timber has given rise to the manufacture of

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toys and musical instruments. Tinplate is also made in connexion with the toy industry. The Weistritz drains the heart of the coalfield, and both the Zweis and Weistritz valleys manufacture upholstering materials—*e.g.*, at Lauban. The principal industries of the hill-streams consist of timber manufactures—lumber, pulp, furniture, and toys—the workers being Poles. The original linen industry of Peterswalden and Langenbielau has given rise to cotton and dye manufactures. Waldenburg, on the Polsnitz river, is the chief centre of the coalfield, and manufactures porcelain and linen. Unfortunately the pits both here and at Altwasser, Gottesberg, Dittersbach, Neurode, Mittelsleine, and Charlottenbrunn are above the limits of navigation, so that the coal is used chiefly in local manufactures. Schweidnitz (33,000 inhabitants) shares in the iron and steel industry of Waldenburg and Dittersbach, and manufactures machinery and glass as well as linen and cotton. Local coal is also used in the chemical industry. South of the Waldenburg industrial district the German frontier forms a salient to the south of the Glatzer Gebirge, which resembles the Black Forest in possessing a number of delightfully situated spas, with beech-forests rising to nearly 3500 feet above sea-level. The general character of the Riesengebirge is similar to that of the gneiss scenery of the Scottish Highlands, but in the neighbourhood of Waldenburg and Glatz Primary rocks have been preserved by a series of faults (*cf.* the Rift Valley of Central Scotland). The neighbourhood of Waldenburg possesses coal, but near Glatz the Lower Primary rocks which partially surround the coalfield give rise to extremely picturesque scenery. Glatz (15,000 inhabitants) commands routes into Czecho-Slovakia, and is an old castle-town with local cloth, leather, and hosiery industries. The abundance of snow between December and April makes this one of the most important winter-sports centres in Germany, the pine-forests of the Schneeberg giving an Alpine appearance to the little mountain resorts. The Neisse breaks through the Eulengebirge at Wartha, an old pilgrimage centre. Neisse, commanding the entrance to the Upper Silesian plain, is an old fortress with a number of linen- and

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woollen-mills. Fruit-growing is important between Neisse and Loebischütz.

(b) **The Silesian Plateau.** Upper Silesia may be divided into three sections: (i) the forests and pastures of the west forming a continuation of the upland region of the foothills of the Sudetes and the plateau of the Western Beskids district of the Carpathians, (ii) the central plain of the Oder, which is a continuation of the rich agricultural plain of Lower Silesia, and produces rich crops of wheat, barley, oats, potatoes, flax, and sugar-beet, and (iii) the eastern plateau of Tarnowitz, which is covered with glacial drift, with inliers of muschelkalk and Keuper formations, and stretches into Poland in the neighbourhood of Częstochowa, where the surface consists of unfertile Jurassic rocks. This frontier zone is a region of heath and woodland covering a great part of the district lying between the headwaters of the Vistula, Oder, and Warthe. (For the agricultural development of the Silesian plain see page 389.)

The Upper Silesian Coalfield

The Upper Silesian coalfield is one of the principal industrial districts of Central Europe, and Silesia is still the most important and largest province of Eastern Germany, and holds a leading position in mining, smelting, textile, and glass industries. The Upper Silesian coalfield is part of a large basin which extends from Czecho-Slovakia to Poland. In shape the known parts of the coalfield form a rough quadrilateral, with its angles at Ostrau, on the Czecho-Slovakian frontier, at Golonog, near Dąbrowa, at Tenczneh, in Galicia, and at Königsberg, in what was formerly Austrian Silesia. The German portion lies almost entirely to the east of the Oder, but there are seams of coal near Hultschin, on the left bank in the angle formed by the main stream and the Oppa. The chief centres of production are Gleiwitz and Beuthen, in Germany, and Królewska Huta (Königshütte) and Katowice (Kattowitz), in Polish Silesia. New areas in this coalfield are being opened up near Rybnik, Nikolai, and Hultschin.

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Throughout the basin the coal is of good quality, with seams up to eighty feet in thickness, and capable of being mined mechanically. The chief defect of the coal is that it is not suitable for the manufacture of blast-furnace coke. At the present rate of output the coal reserves will last for about two thousand years. Zinc and lead are found in conjunction with iron ores near Beuthen, in a ridge of muschelkalk which in pre-War days produced nearly 60 per cent. of Germany's output of spelter. Silver and lead are also found at Beuthen, while copper is mined in small quantities, the ores being of better quality than those of Saxony. Before 1914 there was a regular import of iron ore from Slovakia, Styria, and Sweden. In 1913 the Upper Silesian coalfield produced nearly a million tons of pig-iron in the furnaces at Gleiwitz, Beuthen, Königshütte, and Myslowitz. At the present time what remains of German Upper Silesia produces less than a third of this quantity. The greater part of the zinc output (500,000 tons) was formerly derived from the Tarnowitz district, but the chief zinc-ore mines are now in Poland, and the German output has fallen off considerably. In consequence of the loss of the zinc-mines Germany is no longer in a position to dominate the European zinc market.

Much of the coal is carried by the Klödnitz Canal (2,600,000 tons per annum) to Kosel, where there are large paper, cellulose, and electricity works. The chief towns on the Oder are Ratibor (37,000 inhabitants) and Oppeln (40,000 inhabitants). Ratibor has chemical and engineering works and a sugar-refinery, while Oppeln is an agricultural centre with grain, timber, and leather trades. The chief industrial centres are Beuthen (86,000 inhabitants), the centre of the coal, steel, chemical, and zinc industries, Hindenburg, or Zabrze (122,500 inhabitants), which also has coal, steel, and glass industries, and Gleiwitz (95,000 inhabitants), which is the terminus of the Klödnitz Canal. Gleiwitz is the great market of Upper Silesia for grain, wool, wine, and leather manufactures, machinery, chemicals, cement, and paper, and it exports large quantities of coal in 400-ton barges to the Oder valley.

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The Partition of Upper Silesia

The Treaty of Versailles attempted to readjust the boundaries of Central Europe according to national sentiments, and as there was a large Polish minority in Silesia (40 per cent.) Upper Silesia was made into a plebiscite area. The plebiscite

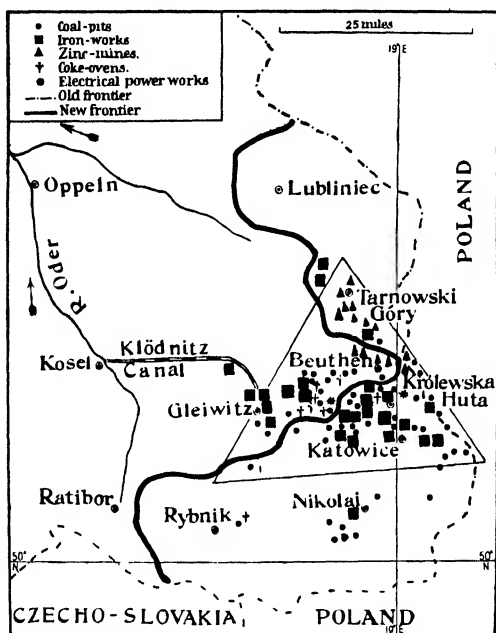


FIG. 71. SKETCH MAP OF UPPER SILESIA,
SHOWING THE INDUSTRIAL TRIANGLE

revealed a German majority, and Germany claimed to retain the whole of Upper Silesia. This claim was resisted by Poland, who was backed by France, and a struggle for possession of the industrial triangle including Tarnowitz, Gliwice, and Katowice began. Within this region the total German vote was 707,000, and that of the Poles 470,000. The towns were overwhelmingly German, but the colliery and agricultural villages were largely Polish. The German

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majorities in Królewska Huta and Katowice were isolated from the bulk of the German population. Polish troops invaded the district, and an outbreak of war seemed inevitable. The League of Nations was called upon to settle the matters under dispute and to draw a new frontier.

The real problem of the Industrial Triangle was that a considerable proportion of the population consisted of Polish labourers. On the other hand practically the whole of the capital invested and the industrial organization which had been built up were German. The new boundary is a compromise, and in no respect gives satisfaction to Germany. Germany's disappointment is increased by the fact that the new frontier was drawn up by lawyers instead of by industrialists or geographers, and there are cases where water-supplies are obtained from one side of the boundary and sewage disposed of on the other. Gas-works are separated from gas-consumers, steel-works from engineering factories, and zinc-mines from galvanizing works. In one case a dispute arose because a pit-shaft was in one country and the workings in the other. Matters were further complicated by the fact that Germany is the chief market for Upper Silesian coal, though at present only a small proportion of the coal is mined on the German side of the frontier. Poland uses large quantities of timber as fuel, and there is not as yet a sufficient market for the coal which is produced within the Polish borders. Polish taxation is high, and there have been vexatious customs tariffs, which have formed an obstacle to the resumption of the normal development of industry, especially in the case of zinc.

Transport is a real difficulty, as the Polish railways do not link up readily with those of Upper Silesia, but in course of time it is probable that a new market for Upper Silesian coal will be found in Poland, as the Polish iron-mines, long derelict, are being reopened and Poland is gradually developing industries both in Upper Silesia and in the Dąbrowa coal-field, which lies to the north-east. For a time Polish coal has invaded the Baltic and Scandinavian markets, but only because it has been sold at very low prices. The alternative is for Polish Upper Silesia to be reabsorbed by Germany,

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but this would probably take place as a result of war, and not of negotiation. What will happen depends on the rate at which the markets of Eastern Europe recover their capacity to absorb the surplus coal of Upper Silesia.

It should be noted that Poland now holds in Upper Silesia twenty-two lime-works, fifteen iron- and steel-works, nine machine-works, twenty-three blast-furnaces, twelve iron-ore mines and zinc-mines, producing 227,000 tons of ore, and fifty-three coal-mines, producing more than 30,000,000 tons annually. The chief area of future coal-mining lies in Poland. (For Polish Upper Silesia see page 599.)

CHAPTER XIX

THE GERMAN LOWLANDS

THE northern plain of Germany forms the natural route between Russia and the low-lying coastal plains of France and the Low Countries. Unlike Holland, its surface is seldom below sea-level, while in the north-east and north the monotonous succession of sandy heaths, marshes, and sluggish rivers is broken by low-forested hills bearing numerous lakes. Practically the whole of the plain is strewn with erratic blocks and heaps of glacial drift derived from the Finno-Scandian plateau. In the soft glacial soils the rivers have dug wide trenches and covered their floors with alluvium, which forms excellent farmland when drained. The alluvial deposits make it possible to trace the former courses of the glacial rivers between the Warthe and the lower Elbe and between the Oder and the Aller and Weser. The present channels of the lower Oder and Vistula are of recent origin. Outside the coalfields there is relatively little mineral wealth in the German plain. Lignite is found in several parts of Brandenburg and Saxony, with rock-salt and gypsum. Brown ironstone has been mined at Misdroy, while a little petroleum occurs in the Lüneburg Heath, together with *keiselguhr* and kaolin. Most of the industries are based on agriculture, and are confined to the river valleys, though glass is manufactured in Brandenburg and cloth in the Mecklenburg hill country. Because of the cheapness of transport much use is made of foreign supplies of jute, rubber, cork, palm oil, and imported tobacco, and there are many machine industries. The most important towns occur at points where routes cross, at the former limits of river navigation, and at other places where a change in the method of transport is necessary.

The German plain must be regarded as a zone of transition between Eastern and Western Europe. Both historically

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and physically the western part of the plain is related to Holland and the eastern part to Poland and Russia. West of the Elbe the farms are small and are intensively cultivated by independent and tenant farmers, while to the east is the country of the large estates, controlled by the

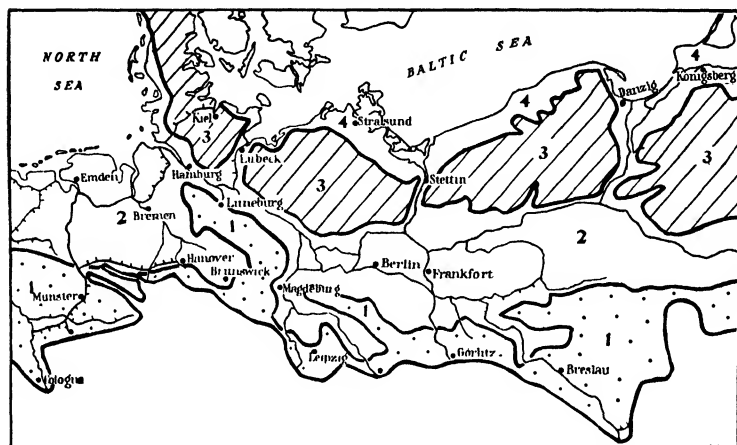


FIG. 72. PHYSICAL SUBDIVISIONS OF THE GERMAN PLAIN

1, the southern terrace; 2, the central valleys; 3, the Baltic ridges; 4, the Baltic coasts.
Note how the navigable rivers and canals indicate the position of glacial channels.

Junker class and retaining traces of semi-feudal conditions in spite of the post-War subdivision of many of the larger estates.

SUBDIVISIONS OF THE GERMAN PLAIN

1. The Southern Terrace

Two great belts of moraine material occupy those parts of the North German plain where for long periods of time the edge of the great ice-sheet halted during its retreat to Scandinavia. The southern terrace consists of a series of low plateaux, which extend from Tarnowitz (Tarnowski Góry) through the Trebnitz hills, reappear on the west of the Oder in the Katzenburg ridge and lower Lausitz plateau, and continue north of the Elbe in the Fläming, which skirts

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the north of the uplands until it reaches the moors of Lüneburg. In the south there are several districts of loess where agriculture flourishes, but in many parts of the glacial plateaux arable farming can be carried on only with difficulty.

To the south of the Ems marshes lies the Westphalian plain (see page 340), which stretches from the Dutch frontier to the Teutoburger Wald and the Sauerland plateau. To the south of Rheine, where the Ems enters the marshland of the Twist district, the country is well cultivated, and there are considerable areas under fruit-trees and other trees. The lower Rhine has already been discussed, and the importance of the rich grainlands of Münster contrasted with that of the orchard and pastoral country of Geldern. Both these areas, however, possess textile and metal industries because of their nearness to the Rhenish-Westphalian coalfield and industrial region.

To the north of the central uplands the Lüneburg Heath rises in a broad, level sandy plain similar to the Geest of Holland and the Belgian Campine. There are few lakes, and the grey grass and heather provide pasture for black-faced sheep, which are the chief basis of economic life. The Lüneburg villages are found where there is water, and the district is a nursery of irrigation farming. Before the World War numbers of heathmen went annually to carry out irrigation work in similar districts in Russia and Sweden. The only town of importance is Lüneburg (28,000 inhabitants), at the limit of navigation of the Ilmenau. During the Middle Ages local salt deposits made it a centre for the salting of herrings, and it became a Hanseatic town. Lüneburg commanded the road across the heath to Brunswick and South Germany but the fall of Hanseatic trade left it in a commercial backwater. During the nineteenth century railway developments brought into existence cement and metal industries, which use local deposits of chalk and gypsum. The south of the heathland is drained by the Aller, which is navigable as far as Celle (24,000 inhabitants), a small agricultural market in the extreme north-west of the potash district. Domestic industries—*e.g.*, baskets and umbrellas—are still carried on

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here. Patient draining and soil improvement by the keeping of stock have rendered a large proportion of the southern area fit for cultivation. At the present time nearly two-fifths of Hanover and Brunswick are under crops. Two-thirds of the arable area are under rye, oats, and potatoes, and there are smaller areas under wheat and barley. The unculti-



FIG. 73. THE LÜNEBURG HEATH

The Lüneburg Heath is part of the great chain of sterile sandy plains and low plateaux which stretch from the "Gâtine" of the Loire, through the Campine or Kempenland of Brabant, the Geest of Gelderland and Overijssel, into Germany. They are scantily populated regions of difficulty.

By courtesy of the German State Railways

Photo by Wilhelm Blum, Bremen

vated area supports large numbers of sheep, while the grain districts provide food for pigs. In the east there are large areas under forest.

Between the Elbe and the Schwarz Elster in the south and the Havel and the Spree in the north lies a region of glacial soils known as the Fläming. Here large areas are under pasture, with occasional fields of rye, oats, and potatoes. The chief market is Jüterbog, the modern railway

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centre at the head of medieval navigation on the Nathe river. As in similar districts in the Geest and Lüneburg heaths, the population of the Fläming and lower Lausitz districts is scanty (less than 130 persons per square mile). In fact, in many parts large areas are only now being drained, fertilized, and colonized. In the Spreewald, and even in the neighbourhood of Berlin, new agricultural villages are being made, though not on as large a scale as was formerly the case in West Prussia. Poor regions frequently carry on manufactures, and the cattle and sheep pastures of the lower Lausitz have given rise to cloth and leather industries in the larger towns—*e.g.*, Luckenwalde (23,000 inhabitants). The Spree rises in forested country in the upper Lausitz and flows through the rapidly developing lignite area of the lower Lausitz into the woodlands and marshes of the Spreewald. The lignite supplies power for the cloth industry of Spremberg (12,000 inhabitants) and the glass-works of Werwasser. The Upper Spreewald is a region of flat pasture-land where cattle-rearing, nursery gardening, and fishing are the principal occupations. Many of the villages can be reached only by boats in summer and across the ice in winter. The people are often of Wendish origin, and speak a language akin to Serbian. Kottbus (50,000 inhabitants), which lies at the point where the Posen-Leipzig and Berlin-Silesian railways cross, is the chief town, and has a number of wool and linen yarn factories. Lehde, "the Venice of the Spreewald," is a popular tourist centre.

Between the Oder and Elbe valleys lie the Lausitz uplands, whose pasture, forest, water-power, and lignite resources are the bases of woollen and linen industries (*cf.* Görlitz, page 366). This district is drained by a number of rivers which do not become navigable until they reach the level of the Oder plain. Sagan (15,000 inhabitants), at the junction of the Bober and the Queis, carries on a brisk trade by river and manufactures machinery, glass, and woollens. The Neisse pursues a course parallel to that of the Bober, and though the river is not navigable there are several industrial centres. Forst (34,000 inhabitants), where an island facilitated bridging, makes pottery as well as

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textiles, but Guben (41,000 inhabitants), where the river becomes navigable, is the chief commercial centre of the lower Lausitz textile district. Both in the Lausitz upland and in Silesia the population is more dense on the low plateaux which separate the valleys than along the rivers (*cf.* the Wear valley). In the south-east, and especially in Silesia, the soil is good, and large crops of sugar-beet and wheat are grown.

2. The Central Valleys

Between the glacial terrace of the south and the Baltic ridges lie the central valleys in which during the formation of the Baltic moraines much of the drainage of Central Europe was ponded up. For a time the Elbe received as tributaries the waters of the Oder and Vistula systems. When the ice melted these rivers drained into the Baltic, but the old channels connecting them with the Elbe still remained, and are now used for the great canal system of the German plain. The alluvial valleys contain large areas where agriculture flourishes. In the east nearly 60 per cent. of the land is arable (*cf.* Westphalia 39 per cent. and Rhineland 37 per cent.), but the system of large estates found east of the Elbe is less productive than that of the more intensively cultivated holdings of Western Germany. West of the Elbe mixed farming is common, and the area under dairy cattle is increasing. The lost provinces of the east—Poznań and West Prussia—were formerly the chief granary of Germany, rye being important in the north and wheat in the south.

Two main depressions should be noted. To the south of the Baltic ridges the line of the Netze and lower Warthe is continued through the Oderbruch and lower Havel to the lower basin of the Elbe. The other depression stretches from the upper Warthe along the Oder into the badly drained Spreewald and enters the Elbe valley in the neighbourhood of Magdeburg. These depressions were formerly occupied by marshes, and there are numerous deposits of peat. In the west there are large areas of alluvium, and the North Sea coast resembles that of Holland in being fringed by dunes

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which protect the low-lying marshlands of the coast. Though the marshy areas are above sea-level dikes are needed to prevent flooding from the rivers, and, as in Holland, the farms occupy little patches of rising ground. As in the English fenlands, the people of the German marshes maintained a state of semi-independence, especially north of the Eider, in Sleswig, where the Frisians formerly maintained an independent confederacy. Frisians still live in Sleswig and between the Weser and the Elbe.

In the Ems district peat moors occupy nearly 2000 square miles, while swamps occur in the high moors of East Friesland, Aremburg, and Oldenburg. The Devil's Swamp, near Bremen, was of a similar type before it was drained and cultivated. In many places, and especially round the thirteenth-century colony of Pappenburg, the fens have been reclaimed, large areas being used as cattle pasture. The Fehne villages consist of long lines of houses on the canal banks, and Pappenburg, which is ten miles long, was for many years only one house in width. The Ems is navigable below Münster, and there are canal communications eastward from Rheine to Minden (*Porta Westfalica*) and westward into Friesland, in Holland. From Emden there is a canal route to Jade Bay, at Wilhelmshaven, and thence along the coast to Bremerhaven. Near its mouth the Ems is connected by canal with Gröningen and the *Zuider Zee*, and also to Oldenburg, and thence by the Hunte river to the Weser near Bremen. The existence of these waterways ensures cheap transport by keeping down railway rates. The lower Ems country resembles Dutch Friesland in its production of potatoes, cattle, and horses. Emden (27,000 inhabitants), the 'port' of Dortmund, possesses a fishing industry, and because of the cheapness of coke and imported Swedish ores has important blast-furnaces.

The Hunte river is navigable from Oldenburg (33,000 inhabitants), on the Hunte-Ems Canal, a market for grain, timber, and horses. It is an important import port, and has developed iron, glass, tobacco, leather, and beer industries.

The lower Weser is navigable for barges, but it suffers in

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competition with the Elbe and the Rhine in that its lower course is full of meanders. Its coal resources are negligible, and, as the region through which it flows is not especially fertile, its hinterland is relatively unproductive. The division of the Weser basin into a number of small states has hindered considerably its economic consolidation. Bremen (294,000 inhabitants), the lowest bridge-town, early became the chief commercial centre of the Weser valley. The seat of an eighth-century bishopric, it flourished as a Hanseatic sea-port in the thirteenth and fourteenth centuries, and shared in the decline of the Hanseatic cities until the nineteenth century. Since 1900 it has specialized in North American trade, and is the headquarters of the Norddeutscher-Lloyd liners. It imports about 4,000,000 tons of goods annually, chiefly bulk cargoes of grain (750,000 tons), cotton (500,000 tons), timber (250,000 tons), and petroleum (100,000 tons). It is the principal tobacco port of Europe, and has a large trade in wool, jute, rice, coffee, and maize. The command of these staples has given rise to the refining of petroleum, rice-milling, and jute-spinning. Most of its inland traffic, however, is carried by rail, and its import traffic is twice as large as its exports, which consist chiefly of coal (250,000 tons), metals and machinery (250,000 tons), fertilizers (100,000 tons), and paper. With the growth in size of modern ocean-going vessels an outport has been developed at Bremerhaven (23,000 inhabitants), at the mouth of the little river Geeste (*cf.* Liverpool and Hull), and a large shipbuilding industry has developed. Delmenhorst, near Bremen, shares in the industries of that port and manufactures linoleum from imported cork. At the mouth of the estuary Geestemünde (29,000 inhabitants), which was founded in 1857 by the Hanoverian Government as a rival to Bremerhaven, is the chief fishing-port. To the north the Friesland coast consists of dunes, and has coastal fisheries similar to those of Holland and Belgium.

The Elbe enters Germany through the Elbe gorge, and is navigable for 800-ton barges from Usti (Aussig), the port of Bohemia. In the neighbourhood of Dessau the Elbe leaves the older alluvium, and throughout its lower course

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the channel is marked by numerous meanders which formerly rendered navigation difficult. At Magdeburg (297,000 inhabitants) the Elbe is divided into three channels. This facilitated bridging, the citadel occupying the main island. As the Borde upland lies to the west, while the eastern banks are marshy, the site is easily defensible. As the Elbe suddenly changes direction here and flows north, this was the most suitable point for the transshipment of passengers and goods. As the surrounding district is fertile, the city is an important agricultural market. In common with Baden and Denmark, Saxony was freed from irksome feudal conditions at an early date, and its command of the land-route to the north of the uplands of Central Europe caused Magdeburg to become one of the chief commercial centres of European trade. Local deposits of salt gave rise to the salting and export of herrings throughout the Middle Ages, but as the salt-trade became the monopoly of the Church the industry declined when the town, which was a Protestant centre during the Thirty Years War, was practically destroyed in 1631. During the nineteenth century Magdeburg became the headquarters of the beet-sugar industry, and its situation would have made it a suitable capital for the German Federation. In the first scheme the lines of Saxony were intended to form the foundation of the railway system of the whole of Germany, but, unfortunately for Magdeburg, they were eventually focused on Berlin, which became the capital of the German Empire and the chief town of Continental Europe.

Below Magdeburg the Elbe wanders through an alluvial trough between the drained glacial deposits of the Letzburger Heath on the west and the alluvial valley of the Ihle on the east. The headwaters of this small river are connected with the Elbe near Bittkau, and with the Havel near Brandenburg. The lower Elbe valley is scantily populated. Fertile marshlands occupy the low-lying country near the river, and are used as cattle pastures. To the east the Geest ("waste") is a barren, sandy plain, similar to the Lüneburg Heath, while the gently undulating hills of the north, which enclose numerous small lakes surrounded by

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woods of beech and pine, gradually merge in the low heights of Mecklenburg.

The chief trade centres of the lower Elbe are Hamburg and Harburg. Hamburg (1,079,000 inhabitants) was a fishing-port during the twelfth century, and grew up at the lowest place where the banks were above flood-level. With the transfer of the herring fishing from the Baltic to the North Sea its trade in timber and fish exceeded that of Lübeck. Late in the eighteenth century Hamburg entered the North American trade and became a large European port. Its great development during the nineteenth century was due to the low cost of inland waterway and overseas transport and to its freedom from restrictive duties. Its barges are able to reach an enormous hinterland. The Elbe waterways carry nearly 19,000,000 tons of traffic (55 per cent. import, 45 per cent. export), but of this less than 1,500,000 tons originates in Hamburg, and it should be noted that it is as a railway *entrepôt*, capable of dealing cheaply and expeditiously with a great volume of transit traffic, that Hamburg is chiefly important. In 1927 it imported from overseas about 16,250,000 tons and exported 7,500,000 tons of goods. Its water-borne trade amounted to 25,000,000 tons and its railway traffic to 22,500,000 tons.

In spite of the absence of a local hinterland Hamburg receives nearly one-third of Germany's imports, while very large numbers of the emigrants of Northern Europe are carried by its American services. Its emigrant traffic helps to restore the balance between the import and export freights. The ships entering its docks carry bulky cargoes of grain, iron ore, oil-seeds, petroleum, fertilizers, flax, coffee, hides, and timber, and leave half empty with mixed cargoes of sugar, chemicals, timber, machinery, and glass from all parts of North Germany. Many manufactures owe their development to the abundance of raw materials in Hamburg's warehouses. Both mineral and vegetable oils are refined, and there are coffee, chemical, chocolate, cattle-cake, soap, flour, fertilizer, rice, and rubber industries. More than half of the ships built in Germany are laid down in Hamburg, and from 1919 to 1925 low manufacturing costs made Ham-

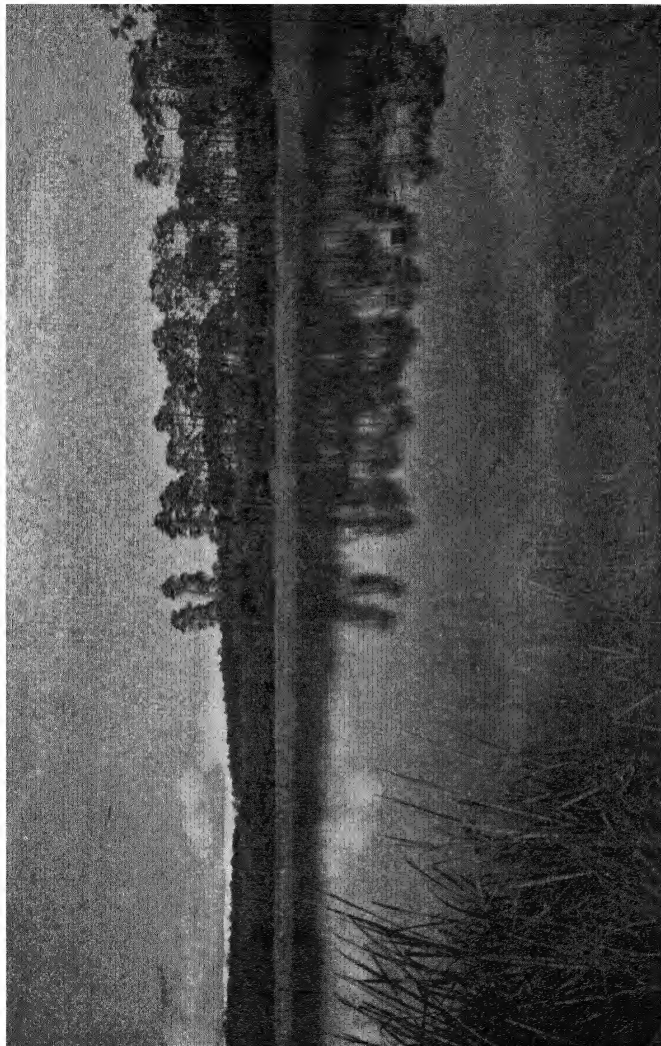


FIG. 74. THE NORTH GERMAN PLAIN NEAR BERLIN: THE WUPATZ SEE

The ill-drained sandy country of the Spree valley is well wooded, and contains numerous shallow lakes. Cultivation is only possible where large quantities of fertilizer are used.

By courtesy of the German State Railways

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burg the chief shipbuilding centre in the world. Harburg (73,000 inhabitants) shares in the shipbuilding, palm-oil, rubber, and fish industries of Hamburg. Cuxhaven is an outport and naval base. More than nine-tenths of the inland traffic of the Elbe valley is between different parts of Germany, the international traffic consisting of the exchange of bulk cargoes of grain and timber with Czecho-Slovakia. Traffic on the upper Elbe is hindered by ice for three months in winter, and though Czecho-Slovakia has been granted warehousing facilities in Hamburg the Elbe waterway is seldom used for trade between Czecho-Slovakia and the North Sea. During the winter the mouth of the Elbe is sometimes choked with ice, and from November to February dense fogs are experienced and river traffic throughout is much retarded. As river transport is slower and more uncertain than on the Rhine, a large proportion of the traffic of the Elbe valley is carried by rail.

The glacial channel through which the Oder formerly flowed to what is now the lower Elbe forms a number of wide and shallow troughs occupied by what are now insignificant rivers. The Havel and the Spree link together a long chain of small lakes. The lower Spreewald is well wooded, with Lüben as the chief market and tourist centre. Beyond the Prahm See the Spree is open to barge navigation, and below Beeskow the river is used by large numbers of barges, which maintain express services at a very low cost. The Havel and Spree waterways carry nearly as large a tonnage (18,250,000) as the main valley, and though Berlin is the greatest port it has less than one-third of the total traffic.

The whole of the area between the Elbe and the Oder is a region of woodland and of settlements in forest clearings. The principal towns are either (i) agricultural markets in forest clearings, (ii) places where short streams which can be bridged connect lakes—*e.g.*, Erkner, between the Dameritz See and the Flakensee—and (iii) places which command dry land-routes across or between marshes—*e.g.*, Baruth, a glass-manufacturing centre on a tributary of the Nathe. Because of the limited extent of the arable acreage which surrounds these villages there are few large towns. The chief centres

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of population possess easy railway communications with Berlin or lie on canals connecting with the Oder or the Spree—*e.g.*, Fürstenwalde and Cöpenik. The easy communications by water serve both for the downstream traffic in timber and for the import of other raw materials used in local industry. Electric power is supplied from the power-stations in Berlin and in the lower Lausitz lignite district.

The development of Berlin (4,000,000 inhabitants), the largest town on the continent of Europe, epitomizes the rise of modern Germany to the rank of a great commercial and political power. After the Roman Empire had broken up Slav settlements came into existence along the Spree and the Havel. These were quite small at first, and probably of an unmilitary character. With the rise of German power, and especially in the ninth century, the region lying to the west of the Elbe was strongly organized by the Teuton founders of the Holy Roman Empire. The Northern 'mark,' which was organized to defend the eastern frontier, included what afterward became the state of Brandenburg. To the east the area of the Spree and Oder valleys was occupied by Wends, Poles, and other Slavs. The subsequent history of this region was complicated by racial and religious differences, but throughout the chief factor in the localization of the East German capital was the existence of the Poles.

The first frontier capital of the Germans was Brandenburg, which occupied a strong position on the Havel at the end of the Plauersche See. This was taken from the Slavs early in the tenth century, and though it was regained by the Wends it finally became German in 1157. For five hundred years it remained the chief place in the mark—the forward defensive post against the Poles. Naturally, its market became increasingly important as the forest was cleared (present population 61,000). Missionary influence was as powerful as military conquest in carrying German power eastward along the Havel, and a number of permanent fortresses and mission centres were established—*e.g.*, at Potsdam and Fürstenwalde.

Polish influence in East Germany became more pronounced as time went on, and was countered by the foundation of

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German military colonies. The great difficulties where the two nations were colonizing the same area were due to (i) the higher birth-rate of the Poles, (ii) the difference in religion, the Poles remaining Roman Catholic when the Brandenburgers and Prussians adopted Protestantism, and (iii) the large feudal estates of the east employed large numbers of Poles, while the Germans were chiefly industrialist farmers who were free tenants of the land they cultivated. These conditions of servile and free tenure existing side by side have always been a menace to the standard of living of the majority of Germans. Even at the present day, after more than a century of Prussian rule, the population of the Oppeln and Poznań districts is predominantly Polish. The superior military organization of the Brandenburgers enabled them to push the frontier farther east, and after 1640 Potsdam (66,000 inhabitants), at the junction of the Havel and the Nathe, occupying an easily defended position almost entirely surrounded by lakes, was chosen as the headquarters for the rest of the seventeenth and eighteenth centuries. It is still the chief corn and cattle market of the province of Brandenburg, and manufactures woollens, cottons, silk, and sugar. Spandau (96,000 inhabitants), another residence of the Electors of Brandenburg, at the junction of the Spree and the Havel, and occupying a similar defensive position, is a great military centre, and manufactures textiles, tobacco, and military supplies.

Each of the towns is situated where sufficient alluvium has been laid down in the meanders of the river to allow agriculture to be carried on. Elsewhere the surface consists of poor glacial sands, which support pine-forests and poor pastures. In each case the population supported by local agricultural resources is not more than 20,000. But for their military importance these places would be small agricultural markets, with little industries based on local resources. At Burg (23,000 inhabitants), on the Ihle Canal, the woollen industry was introduced by French Protestants sheltered after the Revocation of the Edict of Nantes by the Elector. Rathenow (21,000 inhabitants) manufactures glass spectacles.

Berlin had a similar origin, and was a castle on an island

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in the Spree during the fifteenth century. At this point the plain of the Spree is about three miles wide, being bounded by the river terraces, which are from thirty to forty feet above the level of the Berlin plain. During the seventeenth century cultivation was gradually extended, and by 1700 the population was 29,000. Berlin was an agricultural and military town of no special importance. Until 1875 it was

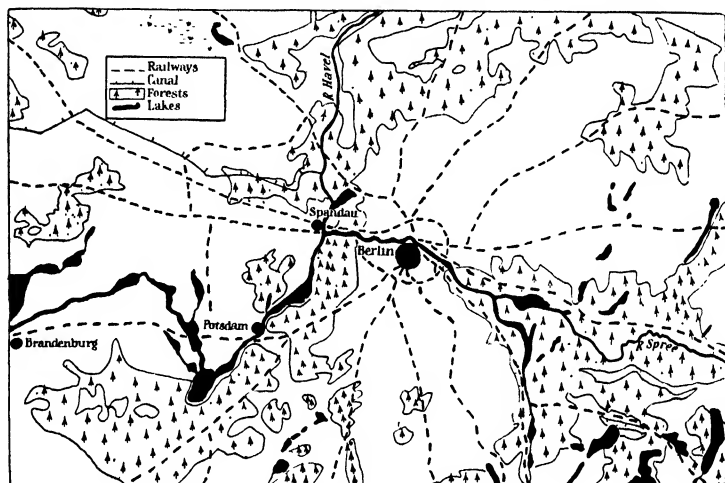


FIG. 75. THE SITE OF BERLIN

Berlin, the largest town on the Continent, originated as a forward post against the Poles, but owes its present importance to its excellent railway and water communications.

surrounded by a circular wall, and possessed an arsenal, iron and porcelain industries having been established under royal patronage. To understand the causes which have made Berlin the third of the world's great cities it is necessary to consider the position of Prussia as the chief military centre of German Protestantism. In the sixteenth century North Germany accepted the Reformation, and, as in Britain, ecclesiastical property was confiscated. South Germany and Austria remained Roman Catholic. Magdeburg would have made an excellent capital if North and South Germany had not been divided. As it was, the Protestant states tended

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more and more to rely on the support of the highly trained Prussian armies, especially toward the end of the eighteenth century, when their existence was threatened by a threefold menace: (i) the French had ravaged the Rhine provinces, which they wished to incorporate with France; (ii) the Austrians wanted to reconquer Silesia; and (iii) the Poles were often hostile, and their rapidly increasing population threatened to overflow the Prussian frontiers and to reach the Baltic. The effect of this threefold pressure was to centralize German resistance in Prussia; moreover, the little German states found themselves surrounded by tariff walls, and, one by one, they entered the Prussian customs union, which gave them an outlet through the Elbe valley.

As Berlin was already an established centre of an organized system of roads, waterways, and railways, it rapidly became an important administrative centre, and by 1871 its population was 826,000. With the establishment of the German Empire by the union of the German states with Prussia Berlin became the centre of the German railway system, as well as a great inland port. It has become the chief market centre of Continental Europe. In 1928 it handled 22,000,000 tons of goods (16,000,000 tons by rail and 6,000,000 tons by water), including 5,000,000 tons of coal, 2,500,000 tons of lignite, 400,000 tons of grain, 300,000 tons of milk, 300,000 tons of meat, 5,500,000 cattle and sheep, and 1,500,000 tons of iron and steel. It has already been noted (page 376) that there are large areas of the German plain where constant manuring is necessary. Berlin markets nearly 750,000 tons of artificial fertilizers, the necessary fuel being obtained from lignite. Berlin's trade in wheat, cattle, timber, and spirits has given rise to the manufacture of books, chemicals, woollen fabrics, furniture, and musical instruments. Its tobacco and porcelain manufactures are also important, and it has recently developed large electrical and clothing industries.

Like the Rhine, Elbe, and Danube, the Oder has been internationalized. Being navigable for 700 miles from the coast to Ratibor in Silesia, near the frontier of Czechoslovakia, it is used by that country for the import of Swedish

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ore and for the export of timber. The canalization of the river above Ratibor will benefit Czecho-Slovakia. At Kosel, where the Klödnitz Canal enters, the Oder has a navigable depth of four feet, and there is a considerable downstream traffic of coal, timber, iron and steel, and cement. The upper Oder flows swiftly through Upper Silesia, but below Breslau much of the country lies below flood-level. Breslau (600,000 inhabitants), the capital of Silesia, lies within an old ox-bow on the left bank of the Oder at a point where several islands in the river have made bridge construction easy. It is the point where the main route from Russia to Austria crosses the river. Between the largest island and the river-banks there are weirs which pond up the water used in the city's hydro-electric works, saving annually about 18,000 tons of coal. The character of its trade has altered considerably during recent years, but coal, grain, and timber are still the chief items of its much-diminished transit trade (100,000 tons by river, 1,200,000 tons by rail) from the Waldenburg and Upper Silesian coalfields and from Czecho-Slovakia. It is the second sugar-refining town in Germany, and manufactures machinery, woollen carpets, and cloth, linen, cotton, and luxury articles, such as gloves. It also produces glass, paper, railway material, porcelain, and earthenware.

Throughout the Silesian plain there are many model farms, with rich harvests of wheat, sugar-beet, flax, fruit, vegetables, and even wine. In the Oppeln-Leobschütz country large areas are under potatoes, while the Breslau district is important for sugar-beet. Silesia has a larger proportion of its area under crops than any other part of Prussia, and it produces almost as much wheat as Saxony. Below Breslau the iron-manufacturing town of Glogau (26,000 inhabitants) is the river-port for North-western Silesia. It should be noted that although the output of the Lower Silesian coalfield is only 3 per cent. of the total German output, it has good coking coal, which is used in many of the small steel-works which produce each year nearly one million tons of finished steel. Glogau is a corn market, with local straw-plait and paper industries, sugar-refineries, and cotton- and woollen-mills.

The Oder continues north and drains the rich farmland

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which lies to the south and west of Frankfort. Here oats, rye, and potatoes are grown, as well as sugar-beet and wheat, while the marshy districts produce large numbers of geese. To the east, toward Poznań, hops and fruit are grown on the Polish border, but the land is less fertile than near Frankfort. The main railway route from Berlin to Poznań and Warsaw crosses the Oder at Frankfort (71,000 inhabitants), where 400,000 tons of coal from Upper Silesia and timber and grain from the Warthe and Netze valleys are transhipped by rail and canal to Berlin and the Elbe valley or to Poland. Its control of routes has made Frankfort a centre for the manufacture of hosiery, earthenware, sugar, and tobacco and a market for agricultural produce and fertilizers. The Berlin-Danzig railway crosses the marshy valley at the fortress of Küstrin (19,000 inhabitants), where the Warthe enters the Oder. The Warthe is navigable throughout the greater part of its course, and gives through connexions by means of the Bromberg (Bydgoszcz) Canal with the Vistula. Kreuz (26,000 inhabitants), a cattle and grain market where the Netze river crosses the Polish frontier, has become an important customs station because of its command of railway routes. Landsberg (40,000 inhabitants), the market of the lower Warthe, manufactures woollens, paper, beer, and spirits. As the Oder approaches the Baltic ridge the character of cultivation changes, and at Schwedt, where it enters the Oder gap, potatoes, flax, tobacco, and wheat replace the intensively cultivated beet of the Frankfort area, while geese become more important near the numerous ponds and small lakes. The little towns of Stargard (29,000 inhabitants), on the Ihna river, and Prenzlau (20,000 inhabitants), on the Ucker, make woollen, silk, and linen cloth in addition to leather, beer, and tobacco. For Stettin see p. 394.

3. The Baltic Ridges

The northern moraine terraces extend from Jutland through the high moors and woodlands of Mecklenburg and Pomerania into East Prussia and the Baltic states. In many districts there are erratics which have supplied building-stone

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from prehistoric times. There are many lakes, some of which are capable of acting as reservoirs for small hydro-electric power-stations. Mixed farming is carried on in the valleys and lumbering in the upland districts. The population is scanty, averaging less than seventy-five persons per square mile, though in the west the development of co-operative dairies has led to a great improvement in the quality of the soils. The addition of nitrates and phosphates, which has proved so successful in the sandy heathlands, has been extended to parts of the Baltic ridges. Unfortunately, however, the Germans have failed to combine sheep and arable farming, as mutton is not popular. On the whole there has been a decline in sheep-farming, but during the World War land went out of cultivation and the area under sheep increased because of the difficulty of obtaining imported fertilizers. Germany is now independent of foreign supplies of nitrates, and sheep are found only on waste lands. Woollen manufactures using local fleeces should be noted at Neumünster, in Holstein, at Schwerin and Parchim, in Mecklenburg, at Neu Brandenburg, and at Osterode, in East Prussia. At Allenstein the woollen industry has attracted linen and cotton manufactures.

Throughout the Baltic ridge country there are sawmills, but where the forest has been cleared and the marshes drained cattle and horses are raised. The existence together of forest and pasture-land has given rise to tanning and leather industries in several towns—*e.g.*, Neu Brandenburg, together with damasks and chemicals—while at Allenstein (36,000 inhabitants) local sands are used in the glass industry. All the Baltic ridge towns are small, being markets for the cattle, sheep, geese, and honey produced in their immediate neighbourhood—*e.g.*, Neu Strelitz, the capital of Mecklenburg, has only 12,000 inhabitants.

4. The Baltic Coasts

This region has low shores pierced by shallow inlets and fringed by almost land-locked lagoons, or *Haffs*, which are protected on their seaward side by storm beaches, or

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Nehrungs. A period of dry weather followed by strong north-westerly gales often results in the sands of the beaches being blown far inland. In the past this has often led to the destruction of cultivated crops, and sometimes whole villages have been destroyed. Pine-trees have now been planted throughout the dunes to prevent further destruction.

The sandy soils are easily cultivated, but are not fertile, and large quantities of fertilizers are needed for the staple crop, potatoes. Much of the alluvial area has to be drained before it is fit for cultivation. The winter climate is everywhere severe, and the summers are often too short and cool for wheat to ripen. Except in Holstein, where the soils have been artificially improved, rye occupies more than a quarter of the arable area (*cf.* oats, 15 per cent.). In Holstein, however, oats and wheat are the chief crops, and there is a great deal of cultivated grassland. In East Prussia less than one-fifth of the lowland is forested, and large crops of potatoes, fodder crops, rye, and oats are grown. Both in Holstein and in East Prussia large numbers of pigs are fed on grain and milk.

The greater part of the east coast is sandy and unfertile, but near the mouths of the Niemen, Pregel, Vistula, and Oder there are large stretches of alluvial soil, which when drained produce large crops of grain (including wheat), flax, and potatoes. The undrained areas form valuable cattle pastures. Mixed farming is carried on everywhere, though the cattle have to be stall-fed in winter. The eastern direction of the Baltic coast and the action of the tide have deflected the mouths of the rivers toward the east. The storm beaches have ponded up large lagoons in which the water is relatively fresh, so that it freezes in winter, though the sea remains open. As the lagoons are icebound, ice-breakers are needed to maintain winter services at Königsberg, Danzig, and Stettin. The eastern ports are shallow and have developed deep-water outports on the storm beaches, connexion with the mother-ports being maintained by means of short ship canals. In East Prussia little more than half the area consists of small farms, the chief products being potatoes and cattle, though the large estates produce considerable quan-

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tities of rye and fruit. Butter is relatively unimportant, and cultivation is chiefly carried on near the coast, while the upland districts of Allenstein and Osterode produce store cattle and timber. Though there have been numerous schemes for improving the canals the amount of water-borne traffic is small. As the railways run chiefly from east to west, East Prussian trade is handicapped by the remoteness of the German markets. If East Prussia is to become self-supporting the communications will have to be entirely remodelled. Of the rivers which enter the lagoons of East Prussia the principal ones are the Niemen and the Pregel. Tilsit (50,000 inhabitants), where the Memelland (Klaipeda) railway crosses the Niemen, was one of the chief pre-War outlets of the timber of Lithuania and White Russia, but the quarrel between Poland and Lithuania has caused this trade to decline. East Prussia is detached from the rest of Germany, and its industrial development has fallen behind that of the other states. Insterburg (38,000 inhabitants), where the railway crosses the Pregel, has linen and metal as well as timber industries.

Königsberg (286,000 inhabitants), at the mouth of the Pregel, was formerly one of the most important transit ports for Russian grain, flax, and timber, but the disturbed political conditions of the Polish-Lithuanian frontier has caused its trade along the Niemen to decline, and it handles less than three-quarters of its pre-War traffic (*cf.* Danzig, which now handles more than twice its pre-War tonnage). The water-borne trade has dwindled to about 1,500,000 tons (imports 687,000 tons, exports 238,000 tons), of which less than 600,000 tons is inland traffic. The volume of transit traffic by rail is about seven times as great as that carried by water. Königsberg is the market for the grain, sugar, and potatoes of East Prussia, and has large silos and flour-mills. Pillau (9300 inhabitants) is the outport of Königsberg, and handles the export trade in timber, flax, hemp, amber from the Sammland and Palmnicken deposits, spirits, textiles, and leather. Elbing (67,000 inhabitants) stands in a narrow gulf which enters the Frisches Haff. Though icebound for more than two months in winter, it shares in the trade of the

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Vistula mouth and manufactures small ships, machinery, tobacco, and beer. It is the terminus of the overland canal (sixty-ton barges) which connects it to Osterode, the centre of a picturesque forest and lake district. If there were no customs frontier Elbing could be made to tap the export trade of Poland. To the west of the Polish corridor there are a number of thriving market towns. Kolberg (30,000 inhabitants), at the mouth of the Persante, is a summer resort, and Köslin (27,000 inhabitants) is an important market for geese and timber, and manufactures woollen hosiery and leather.

Unlike East Prussia, which exports its grain by sea to Holland, and thence to Western Germany, the Pomeranian coast-lands market their produce in Stettin and Berlin. Stettin (250,000 inhabitants), the sea-port of Berlin and the third port of Germany, was a Pomeranian stronghold controlling the mouth of the Oder. It is a centre of railway and canal routes, and possesses a daily service of 600-ton express barges to Berlin. It also sends heavy freight by river to Upper Silesia, receiving in exchange cargoes of coal. Its shipping facilities are greater than those of Danzig, Lübeck, and Königsberg combined, and before the World War its imports amounted to nearly 4,000,000 tons and its exports to 1,500,000 tons. More than 3,500,000 tons of shipping were carried annually along the Oder, Warthe, Netze, Havel, and Spree, and an equal amount was carried by rail. As a result of the partition of Upper Silesia Stettin's share of the coal-trade has been lost to Danzig and Gdynia, but its direct services with the Baltic and North Sea ports have been retained, grain, herrings, wine, oil-seeds, colonial products, and iron ore being imported. Occasionally coal is exported from Upper Silesia. Generally speaking, Pomerania has few manufactures, but Stettin is highly industrialized. Imported iron and coke are used in its shipyards, which are among the largest in Germany. Its machinery, distilling, and clothing industries are also important. The outport for the transit trade is Swinemünde (14,000 inhabitants), which is open throughout the year. The bulk of the trade of the Oder valley (9,000,000 tons) is inland traffic. Stettin's imports

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(3,000,000 tons) are chiefly distributed by railways, while less than half the exports (1,600,000 tons) are carried to the port by the Oder and its canals. The future of the port is uncertain, but it should be noted that Stettin is much nearer Czecho-Slovakia than any of the other ports of Western Europe.

The western part of the Baltic coast has low cliffs, and there are fewer storm beaches. Toward Denmark the harbours take the form of deep inlets. The only important fishing-grounds in the Baltic lie to the south-west of Sweden, and it was on the basis of the early fishing industry that Hanseatic trade was built up. Protected from piratical attacks by the island of Rügen, Stralsund (40,000 inhabitants) became an important Hanseatic port, and is now the railway port for the Rügen train-ferry, and exports material for the Stockholm ironworks. Its local trade consists of corn, beer, timber, and linen. Sassnitz is the Rügen terminus of the train-ferry to Malmö (3,000,000 tons). Greifswald (27,000 inhabitants) uses imported fuel and iron in its ironworks, and is also a fishing-port. Rostock (58,000 inhabitants), the lowest bridge-town of the Warnow river, was an important Hanseatic *entrepôt*. It exchanges imported machinery, lumber, grain, herrings, and coal for sawn goods, sugar, and cement produced locally. Its outpost, Warnemünde (30,000 inhabitants), is the railway port for Gjedser (Denmark) and Copenhagen. Wismar (25,000 inhabitants), the port for the Wallenstein river which drains the Schwerin lake, is a fishing-port with tinware manufactures.

The greatest of the Hanseatic ports, however, is Lübeck (121,000 inhabitants), the lowest bridge-town of the Trave river. It rose to greatness as the chief centre of the Baltic herring fisheries, the fish exported to other Baltic ports being exchanged for timber, amber, hides, and grain to such an extent that Lübeck was able to control the export trade of the Baltic. Incidentally this gave the town control of the silver exports of the Oder and Elbe valleys, so that Lübeck became the great financial centre of Northern Europe. The Elbe-Trave Canal gave it control of the traffic of the Elbe valley. During the fourteenth and fifteenth centuries Lübeck

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was one of the greatest commercial ports of the world, but with the development of the North Sea fisheries and the discovery of the ocean-routes it no longer monopolized the herring industry and the supply of precious metals. Gold was drawn from other continents, and the relative importance of fish as an article of diet declined as Protestantism developed. Nevertheless, Lübeck remained an *entrepôt* for grain, timber, fruit, and dairy produce, and has developed iron and shipbuilding industries based on imported raw materials. Furniture, chemicals, jam, and machinery are manufactured, and the exports include textiles and leather goods produced locally. In consequence of the transmission of cheap electrical power from the lignite districts Lübeck's trade is now considerably greater than in 1913.

Kiel (214,000 inhabitants) was a small port (32,000 inhabitants) in 1871, with flour- and starch-mills, a brewery, and tobacco and sugar factories. Its inlet was a suitable centre for a naval port, and its rapid development was due to the construction of the Kiel Canal in 1895. As a result iron, machinery, and shipbuilding industries developed. The canal was enlarged in 1913 to afford passage for the largest battleships, and it became the headquarters of the German Navy. The tolls collected in 1913-14 were little more than 1 per cent. of the capital expenditure, and the canal has not been a commercial success. Unlike the Panama and Suez Canals, it does not connect regions of vast traffic, nor does it greatly shorten ocean-routes. It affords a safe alternative to the fog-bound route round the north of Denmark, but its traffic consists mainly of tramp steamers and vessels of no great size. The trade of the Baltic to the North Sea consists chiefly of wheat, eggs, butter, timber, and wood-pulp, while that in the reverse direction consists of coal, iron, rubber, and manufactured goods. To small ships carrying passengers or perishable goods the saving of time is of great value, even if it involves an increase in immediate expense. Moreover, the voyage round the Skaw can be dangerous in bad weather, and often causes damage to cargoes even if the ships escape harm. Thus for small vessels the safety offered by the canal is a great attraction.

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The commercial future of the Kiel Canal depends on four factors: (i) a considerable growth of traffic between the Baltic and North Seas by the development of more direct ocean services from the Baltic ports, (ii) an increase of passenger traffic, (iii) an increase in the traffic in perishable goods, and (iv) the provision of a better transshipping harbour on the Baltic side of the canal. The development of the countries using the Baltic ports and the improvements of their canal and railway communications, as in the case of industrial Silesia, may possibly lead to increased trade through the Baltic ports, and some of this trade may ultimately go through the Kiel Canal. Improved canal communications between Hamburg and Berlin undoubtedly diverted the grain traffic from the route Riga-Stettin-Berlin to that of Riga-Kiel-Hamburg-Berlin, but the new Elbe-Trave Canal, completed in 1900 to connect Lübeck with the Elbe, is detrimental to the Kiel route. Similarly, the projected Midland Canal, joining the Elbe, Weser, Ems, and Rhine, will certainly divert coastwise traffic, and possibly that of the Kiel Canal, to inland waterways. The much-discussed canal system from Riga to Kherson by the Dvina and Dnieper rivers would divert some of the grain traffic to the Baltic. Of this that intended for Britain would probably come through the Kiel Canal, especially in winter. There would also be created a traffic from Russia through the Baltic in eggs, oil-seeds, wool, ores, sugar, and petroleum and a return traffic from the North Sea in chemicals, fertilizers, cement, machinery, and iron and steel goods.

TONNAGE OF THE GERMAN BALTIC PORTS IN 1927

Stettin	.	.	.	.	4,066,000
Kiel	.	.	.	.	2,442,000
Lübeck	.	.	.	.	1,697,000
Königsberg	.	.	.	.	1,514,000
Sassnitz	.	.	.	.	677,000
Rostock	.	.	.	.	563,000

CHAPTER XX

THE BRITISH ISLES: GENERAL CONSIDERATIONS

THE British Isles lie on the westward edge of the continental shelf, and though separated from are intimately related to Continental Europe. In early times they formed the extreme western limit of European civilization, and their insularity has offered shelter to human societies from the Early Stone Age to the present time. Relics of past culture are specially numerous, and the archæological record is practically continuous from Neolithic times. It is possible to trace the gradual colonization of the forest clearings from the period of the early invasions through the draining of the marshes commenced by the monks in the Middle Ages and extended by Dutch engineers during the seventeenth century. The enclosures which began in the fourteenth century may be compared with the kind of settlement which is proceeding at the present time in Canada and Australia. During the period of enclosures Britain became a great producer of raw materials, and practised a self-supporting system of agriculture until the end of the eighteenth century.

The importance of the United Kingdom is altogether out of proportion to the space it occupies, and is due to its position in relation to the rest of the world, to its mineral wealth, and to the enterprise and energy of its inhabitants. Before the discovery of the ocean routes to the East and to America Britain's relations with the rest of the world were those of a recently colonized country which supplied the adjacent parts of Europe with such raw materials as wool, leather, and lead, and received in return those foodstuffs and manufactures which could not be produced locally.

The discovery of the ocean-routes revealed the importance of Britain's command of the sea approaches of North-western Europe. Unique among European countries in its immunity from military invasion, the inhabitants were free to

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develop the islands' internal resources and to embark on overseas mercantile expansion on a scale which no other country has been able to rival. The sea-routes connecting the great populations of Asia and Western Europe pass close to Britain's shores, and the large number of natural harbours offer safe anchorage to shipping.

These islands have also been a sanctuary for Continental refugees, and each political and religious war in France or the Low Countries has brought to this country men with new and useful ideas. British farming has consequently maintained itself on the level of the best systems of Continental agriculture, and as the climate permits outdoor work to be carried on throughout the year there is no close season for agriculture and industrial work.

One of Britain's greatest industrial advantages, however, lies in the occurrence of coal and iron at or near tidal water. Heavy articles of iron and steel can thus be made cheaply in many coastal districts. Shipbuilding has grown to be one of the most characteristic of British industries, and by her superior maritime power Britain has been able to acquire colonial possessions which cover nearly one-quarter of the habitable area of the globe. The modern development of the British Isles began in the early years of the sixteenth century, and industry received a great impetus during the eighteenth and early nineteenth centuries, when mechanical inventions allowed full use to be made of the coalfields, and led to the speeding up of transport and manufacture.

During the past fifty years, however, other countries, formerly our customers, have begun to develop large-scale manufactures of their own, and the number of open markets overseas has begun to decrease. During the nineteenth century the population of the British Isles increased in proportion to its industrial expansion, but during the present century the population has become too large, and there is at the present time a surplus of at least 2,500,000 people in Britain alone. In order to relieve this over-population several remedies have been suggested. The first, wholesale emigration to Australasia and Canada, has not yet been attempted. Though this would be expensive, the past history

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of colonial settlement indicates that both the Dominion and the mother-country would benefit by carefully organized resettlement. A second proposal is the voluntary limitation of the number of births, and already the birth rate has begun to fall. The third remedy is the intensification of production in order that British exports may regain their supremacy in the world-market.

In any serious study of the British Isles it is necessary to take into account not only the geographical conditions which have determined their past history, but also the possible factors which may influence future development, and there has never been a period in British history so full of human interest or so fraught with dangerous possibilities as the present. To understand clearly the effect of geographical conditions on human progress it is advisable for the student to make a detailed study of one of the sub-regions of the British Isles. A number of distinct types of geographical region may be defined, but there are other regions to which the adjectives 'natural' and 'geographical' have been applied in such a fashion as to cause confusion in the minds of students. Wherever possible these words should be avoided, unless the kind of 'natural' region is clearly defined. Physical and climatic regions are frequently distinct from economic and human regions, which are not entitled to be termed 'natural' or 'geographical' regions. Administrative and political divisions seldom possess complete human or economic unity, and movements have been begun which have as their object the alteration of administrative boundaries so as to include human, economic, social, or racial units.

CLIMATE

The annual sea-level range of temperatures in the British Isles varies from twenty to twenty-five degrees Fahrenheit. There is a tendency toward more extreme conditions in the south-east and more equable conditions in the north-west and south-west, but in all parts local differences of climate are determined chiefly by height above sea-level and by exposure to prevailing winds. The eastern counties are much

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cooler in winter and warmer in summer than other districts. The west is more equable, and the south-west is very mild.

In the north the summer season is very short, but rapid ripening is promoted by the long periods of daylight in July and August. Generally speaking, the west of the British Isles has an average rainfall of more than thirty inches, while in the eastern plains the average rainfall is between twenty-five inches and thirty inches, and a few places near the coast have even less.

Droughts are infrequent or rare. The rainfall is chiefly caused by the passage of areas of low atmospheric pressure or 'depressions' from the Atlantic across the islands, but much comes from the prevailing westerly air-currents. If there were no upland regions there would be a more evenly distributed rainfall. The uplands cause ascending and so expanding air-currents and condensation. Cyclonic rain is much less dependent on surface relief.

In the pressure chart for February 14, 1916, shown above,

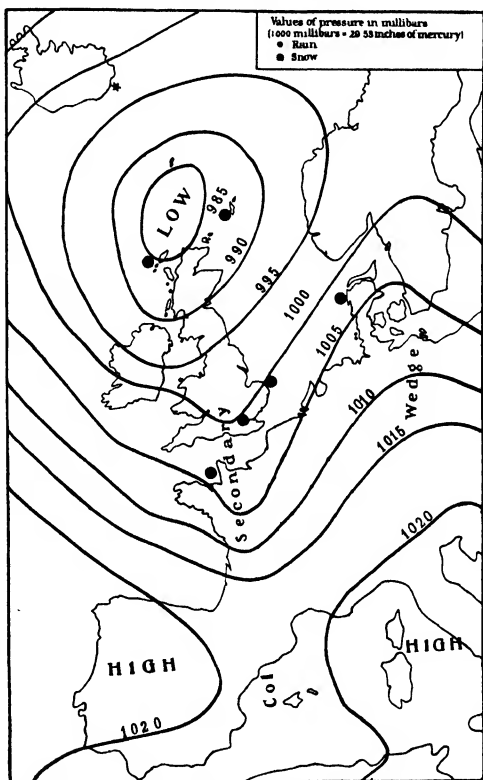


FIG. 76. TYPES OF WEATHER IN NORTH-WEST EUROPE

Pressure chart of Western Europe for February 14, 1916, showing the principal types of weather.

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it is possible to distinguish practically every type of weather experienced in Western Europe. On this day a deep depression, with strong winds and rain, was centred off the north coast of Scotland. Associated with it was a secondary depression over Southern England, where heavy rains and strong winds were also experienced. There were two distinct areas of high pressure, with fine weather and light breezes, over Spain and over Italy and Central Europe, the latter extending as a high-pressure wedge into Southern Sweden. A 'col' of relatively low pressure between the two 'highs' gave thundery conditions over the Balearic Isles. In the north of the Baltic area an old depression was beginning to fill up and die away.

AGRICULTURAL DEVELOPMENT

At the present day only 4 per cent. of the British Isles is forested (*cf.* arable 26 per cent., permanent pasture 33 per cent., moorland 22 per cent., waste 10 per cent., towns 5 per cent.), and the woodland occupies a small fraction of the total area which is unfit for cultivation. Moreover, British commercial timbers, such as the oak and Scots fir, are frequently less valuable for constructional work than foreign varieties obtained from virgin forests or from scientifically managed plantations. Much of the area (17 per cent.), classified as heath and waste could be profitably utilized under properly organized reafforestation with such trees as the Douglas pine. It is estimated that much of the upland areas under sheep at present employing one shepherd per 1000 acres if afforested would support at least ten times as many men. With the extension of the forested areas secondary occupations would be created, and the soils preserved by the roots of the trees would enable the little woodland villages to grow a certain proportion of the food they needed. Up to the present the British forests have been maintained more for their beauty than for their commercial value, and almost everywhere the need to increase home-grown timber supplies has been sacrificed to the requirements of ground game, so that undergrowth occupies far too

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large a proportion of the woods. To increase the area of commercial timber in Britain would tend to check rural depopulation.

Britain grows only one-tenth of the timber she consumes (10,000,000 loads). To make the United Kingdom independent of foreign supplies it would be necessary to plant 40,000,000 acres, more than half the total area, with trees. This would be uneconomic, but 5,000,000 acres of mountain pasture, moor, and marsh are available for development as forest, and would render the British Isles partially independent of foreign supplies. The report of the Forestry Commission suggests that nearly 2,000,000 additional acres of forest could be developed profitably, and would provide work for nearly 33,000 men, and so maintain, with their families, about 125,000 persons. This could be done without decreasing the quantity of meat produced by more than 1 per cent.

More than half of Britain (57 per cent.) is capable of cultivation; more than three-fourths of the arable area lies in the English plain, and less than one-sixth in the Lowlands of Scotland. The amount of land under cultivation, permanent pasture, or unused depends on rainfall, elevation, and soil. In Eastern England the annual rainfall is less than thirty inches, and much of the land is cultivated with one year of grass in a four or five years' rotation. In the west the greater rainfall limits the area of arable land. Where the land is cultivated grass may remain for two or three years in rotations of six, or even nine, years. Generally in the upland districts of the west and north the rainfall is too great and the summer too cool for cultivation, and the land, except in the valley, is left as permanent pasture, chiefly under cattle and sheep.

The English plain is relatively dry, with winter frosts alternating with warm, sunny summers; it is therefore more suited to cereals, the deep soils producing wheat and the light soils barley and sheep. Dairy cattle are found on a variety of soils, wherever the production of wheat is most profitable. There is a close relationship between the density of dairy cattle, the growth of urban centres, and the great

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lines of communication. Thus London draws its milk-supplies from places within a 300-mile radius which have main-line connexions.

Heavy clay soils are always expensive to cultivate, and are chiefly under grass, though in the east the low rainfall limits

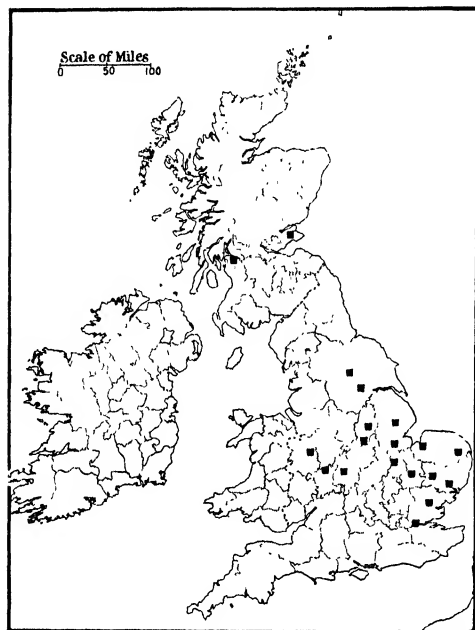


FIG. 77. BRITISH BEET-SUGAR REFINERIES,
1928

their use in dairy-farming. The most productive soils are the black soils of the Fens and the loams. These are fertile and easy to work, and produce heavy crops of cereals, particularly oats, wheat, barley, and roots. The warp soils of the rivers of Lincoln and South Yorkshire are especially important for potatoes, though because of the high cost of inland transport the present tendency is for bounty-fed sugar-beet to displace potatoes.

For many years before the World War Britain was a free market for the surplus beet-sugar produced in Europe, whereas the producing countries relied upon high prices in their protected home markets. As a direct consequence, Britain, like Holland, obtained her sugar so cheaply that great sugar-consuming industries, such as jam- and chocolate-making, arose based on imported supplies. Before the War England could not produce sugar-beet in competition with Continental Europe, but after 1914 the supplies of beet-sugar were curtailed, and Continental exports came to an end.

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High prices stimulated the development of the British sugar industry, and a Government subsidy indemnified both grower and manufacturer against possible loss. By 1925 there were factories at Cantley (Norfolk) and Colwick and Kelham (Notts), the output of sugar being 25,000 tons. In 1927 factories were completed at Ely, Spalding, Wislington, Selby, and York. Though it is improbable that more than a small fraction of Britain's consumption can be produced at home, there are now more than a quarter of a million acres under sugar-beet, and the output of sugar is about 420,000 tons, one-fifth of Britain's total requirements.

In the neighbourhood of the towns market-gardens and orchards are important, subsidiary cider and jam industries being carried on. Hops (20,000 tons) and tobacco are relatively unimportant, being confined to the counties of Hampshire, Surrey, and Kent. Mustard (10,000 tons) is grown near Norwich, the chief centre of manufacture. An interesting example of an agricultural industry persisting after cultivation has ceased is the refining of essential oils at Mitcham, which was formerly a centre of lavender cultivation.

The area under small fruits is determined partly by soil and climate, partly by the system of land tenure (small-holdings), and partly by fluctuations in demand and accessibility of markets. Strathmore and the Carse o' Gowrie are important centres. The Blairgowrie district is important for raspberries, but on at least one occasion the glutting of the market with raspberry jam caused a fall in prices which rendered raspberry cultivation unprofitable. It is probable that improved methods of marketing will lead to an extension of the area under home-grown fruits. The most important single factor in the orchard and market-garden industries is the speed and cost of transport. For example, the stationmaster at Pocklington (Yorks) found that by sending *via* Hull instead of by York washed carrots could be delivered in Manchester in time for the early-morning market. The alteration in route led to a considerable increase in the production of carrots in the Pocklington district.

The area under wheat declined greatly when great railways,

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built to open up the virgin lands of North America, Russia, Australia, and the Argentine, brought down wheat prices to the level of those of Manitoba. In consequence the inland flour industry has also declined, and most of the wind- and water-mills are now derelict, and the industry has migrated to those river-towns which are connected by navigable water with the ports. Most of the imported wheat (5,000,000 tons) is mixed with home-grown wheat and ground at large mills on the Thames, Bristol Channel, Mersey, and Ouse, but recently English varieties have been produced which are capable of being made into flour without being mixed with imported wheats. Though wheat prices have fallen home-fed meat prices have remained above the level of those of imported meat, with the result that arable land is being increasingly used for cattle crops, and large quantities of cattle-cake are prepared from imported grain and oil-seeds at the flour-milling ports—*e.g.*, Hull.

FISHERIES

The world's chief fisheries are found in shallow waters in cool seas, where there is an abundance of plant life in the sea-waters and much organic *débris* from the land. Here food for the fish is most abundant. These conditions occur in the shallow seas surrounding the British Isles, where 80,000 persons are engaged in fishing, the largest fishing fleet in the world being owned by Britain. The supply of fish off North-western Europe is practically inexhaustible, but the fisheries of the western part of the North Sea have recently begun to decline, and much of the fish landed is obtained by large, deep-sea trawlers engaged in long voyages, and served by specially equipped ports, which possess loading and repairing facilities and salt- and ice-works for preserving the catch. Though the British fishing fleet is the largest in the world, the advantage of local fishing-grounds—*e.g.*, the Dogger Bank—is becoming less important, while greater numbers of ships are now sent to more distant seas.

There are three types of fisheries—longshore, surface, and

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demersal. The longshore fisheries for oysters, mussels, and shrimps are chiefly carried on in North Lancashire and on the east coast of Britain. Fish that are taken near the surface are the herring, sprat, pilchard, and mackerel, surface fishing being carried on by drifters. Herrings are found at different places at different seasons. From November to April, when the herrings are absent from British waters, they are taken off the Norwegian and Scottish coasts. During the late spring and summer the herring shoals move southward from Wick and reach the neighbourhood of Yarmouth in October. Unfortunately the Dogger Bank is becoming a less profitable area for all-the-year fishing, and the deep-sea trawlers are being compelled to go farther afield; the cod is now sought in the waters of the Icelandic and Barents Seas, and it is proposed to extend trawling operations to the coast of Labrador. The Icelandic codfish season lasts from January to May, the fish being dried for export to Southern Europe and South America. Four-fifths of the herrings landed at Aberdeen, Hull, and Grimsby are preserved in brine for re-export to Germany, Poland, and the other Baltic countries, but a large proportion of the Yarmouth catch is smoked for the Mediterranean market.

Modern fishing is a joint stock or co-operative industry which depends on a specialized fish dock supplied with an abundance of fresh water, coal, ice, and salt. Fish-drying grounds, smoke-houses, and box factories lie near the landing-place, from which fish are carried in express trains to inland markets. Ship-repairing and -building yards are located near the fishing-port, and the present design of deep-sea trawler has been evolved in the shipyards of Selby, Beverley, Hull, and Aberdeen. The Dogger Bank fleets consist of smaller vessels, which remain at sea throughout the year, the catch being dispatched each morning in special carrier vessels to Billingsgate. Hull is most important in the trade which supplies the London market, but Grimsby is the chief fishing-port, while Hull has lost its position as second port to Aberdeen. Fleetwood, Milford Haven, Cardiff, and Mallaig are the principal fishing-ports on the west coast. The total catch averages about one million tons, and is

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worth about £20,000,000. One-fifth of the catch is absorbed by the London market, which receives much by water. Though four-fifths of the total catch is landed at east coast ports, more than nine-tenths of the fish consumed in this country is carried by rail.

MINING

The chief geographical factor in the development of manufacturing industries in Britain has been the existence of coal and iron at workable depths within easy distance of tidal water. The geological structure of the United Kingdom brings a series of rocks of all ages to the surface, and the list of minerals which have been worked is a long one. Thus, tin-mining, which is still carried on in the west of Cornwall, dates from remote antiquity. The limit of economic exploitation has been reached in the case of most of the non-ferrous metalliferous deposits, except in times of war, when the lead-mines of Montgomery, Flint, Derbyshire, and the Southern Uplands and the copper-mines of Anglesey and Cornwall are reopened. Though mining for non-ferrous metals has almost ceased, some of the mines are worked for such by-products as wolfram, arsenic, and the various spars used in face-powder, porcelain, paint, and paper industries.

Coal is of supreme importance, however, and the amount lying at a workable depth (4000 feet) is 197,000,000,000 tons ($2\frac{1}{2}$ per cent. of the world's reserves). With such a foundation Britain can continue for several centuries as an industrial country. The abundance of coal gives rise to two outstanding advantages: (i) power for local manufactures can be obtained in the coalfields, and (ii) coal is a universally acceptable raw material which can be sold in almost any market at world-prices sufficiently high to pay for the cost of the outward voyage. This means that freights can be lowered sufficiently to attract return cargoes. Britain's annual productive capacity¹ is between 270,000,000 and 290,000,000 tons—about 100,000,000 tons more than Britain's

¹ In 1930 Britain produced 244,000,000 tons and exported 55,000,000 tons of coal.

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domestic needs. This surplus provides one-tenth of the value of the exports and about four-fifths of their volume. The direction taken by coal exports is partly determined by the

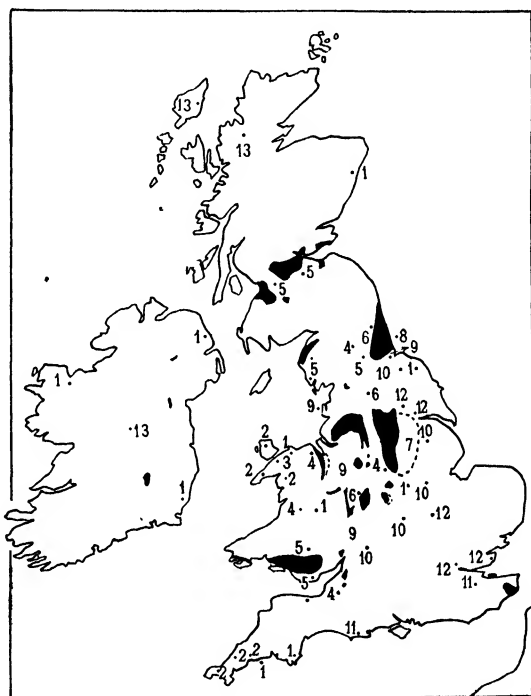


FIG. 78. ECONOMIC MINERALS OF THE
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1, Archæan and igneous rocks and china clay used for masonry and road construction and in porcelain and paper industries; 2, Cambrian and Lower Primary gold, copper, manganese, and tin deposits; 3, Cambrian, Ordovician, and Silurian slate; 4, Silurian and carboniferous lead, silver, and zinc mines, chiefly worked for baryta and feldspar; 5, Carboniferous Limestone quarries and iron-mines (also oil-shales); 6, Millstone Grit, gannister, and fireclay deposits; 7, coal-fields; 8, Magnesian Limestone for iron furnaces; 9, Triassic salt deposits; 10, Jurassic ironstone; 11, chalk-quarries for cement; 12, brick-earths; 13, peat.

possibility of obtaining bulky return cargoes of food or raw materials required for British manufacturers. The organization of the coal-export trade has given rise to the use of

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specially constructed colliers and tramp-steamers, but the integration which characterizes the coal-trade of the United States is not common in Britain. In the North-eastern coal-field, for example, there are at least fifty independent colliery companies, of which only one or two control the sale of coal to outsiders and to the fleet of colliers.

During the World War British export coal was sold at high prices and the domestic supply at relatively low rates, but the development of alternative sources of power in France, Italy, and Spain, our chief customers, the increased use of oil fuel in steamships, and the low rate of exchange in Germany, France, Belgium, and Poland made it possible for these countries to obtain coal more cheaply from the Continental collieries. The post-War decline in the British coal industry was warded off by a series of accidents. In 1920-21 European stocks were low, and prices remained high. In 1922 a great coal strike occurred in the United States, while in 1923-24 the French occupation of the Ruhr brought German competition to a standstill, and it was not until 1925 that it became evident that the British coal industry would have to be entirely reorganized. Even before the War British export coal had been driven out of the Pacific by the coal of Natal, India, Japan, and Australia, and the development of oil-burning steamers and motorships has made it impossible for British coal to pass through the Panama Canal. Since the War German reparation coal has displaced British coal in France and Italy. Spain and Holland have begun to develop their coalfields, while Norway has obtained coal from Spitsbergen. Probably the most important factor in the decline of the British coal export trade has been the transfer of Upper Silesia to Poland. Formerly Upper Silesian coal was sent down the Oder valley and the domestic demand in Germany seldom allowed surplus stocks to be accumulated for export from Stettin. Under Polish ownership a considerable proportion of Upper Silesian and Dombrova coal finds its way to Danzig, at an export price of ten shillings per ton f.o.b. At this price British coal cannot compete in the Scandinavian and Baltic markets, and Polish coal is sometimes marketed in France.

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This has caused an intensification of the distress of the British export coalfields, and a large number of skilled miners have left their homes in North-east England and South Wales in search of employment elsewhere. This scattering of the skilled *personnel* will definitely lower the production of the coalfields, though as yet it is not easy to foresee in what ways this will affect British overseas trade. The great



FIG. 79. FRODINGHAM IRONSTONE QUARRIES, NORTH LINCOLNSHIRE

On the right a mechanized 'navvy' is removing the cover which the transporter is carrying to the left. The ironstone is quarried and carried in the trucks to the blast-furnaces in the rear.

advantage of easily accessible coal-supplies, however, remains, and Britain's manufacturing capacity has never been as great as at the present time.

In 1913 the only area where electrical power was produced on a large scale was in the coke-oven centres of Durham and Northumberland, but at the present time Britain is committed to a policy of wholesale electrification, which will cheapen the cost of manufacture and inland transport to an extent which, it is hoped, will enable British manufacturers to compete again in those world-markets which have been closed since the War.

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The only metalliferous deposits which are still capable of large-scale development are the iron ores. Britain possesses about 5,800,000,000 tons of iron ore, 4 per cent. of the world's estimated reserves. The production of iron ore depends on its nearness to the surface, on the supply of labour available, on the accessibility of coking coal, and on the nature of the ore. As a rule only the richest ores are mined, except in densely populated districts, which provide cheap labour and possess a ready market for pig-iron. Most of Britain's iron ores contain phosphorus, but as some of these are self-fluxing they form the bulk of the iron ore mined. Labour is cheap, and there is a ready market in the metal-using industries, though because of our free-trade policy these do not confine their purchases to the pig-iron and steel produced locally.

In 1913 the British iron-mines produced about 16,000,000 tons of ore, but in 1925 the most 'normal' of the post-War years, the output was only 10,100,000 tons.¹ Less than one-tenth of the ore mined is non-phosphoric, and pure hæmatite is obtained only in the Millom, Cleator, and Furness districts of Cumberland and North Lancashire. Eighty-seven per cent. of the ore is obtained from the Jurassic belt which stretches from the Tees mouth to Portland. In the Cleveland district, which produces 23 per cent. of the total output, the ore is obtained from the Middle Lias at Ayton, Eston, Loftus, and Skelton. The ores of the Scunthorpe-Frodingham district (20 per cent.) belong to the Lower Lias, but those of Leicester and Oxford (15 per cent.) are again in the Middle Lias. The ores of South Lincoln, Rutland, and Northampton (29 per cent.) are found in the Lower Oolite. About 3 per cent. of the total output is still obtained from the coal measures, chiefly in the Pottery District of North Staffordshire. In 1929 5,600,000 tons of iron ore were imported, chiefly from Spain, Sweden, Algeria, France, and Greece. The total amount of pig-iron produced in 1930 was 6,200,000 tons, 30 per cent. at Cargofleet and Middlesbrough, where the close proximity of Magnesian Limestone (Quar-rington), coking coal (mid-Durham), iron ore (Cleveland),

¹ In 1929 13,200,000 tons of iron ore were mined in the British Isles, but in 1930 the amount had dropped to 11,600,000 tons.

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and a navigable estuary encouraged the rapid development of smelting by enterprising industrialists. One-sixth of the

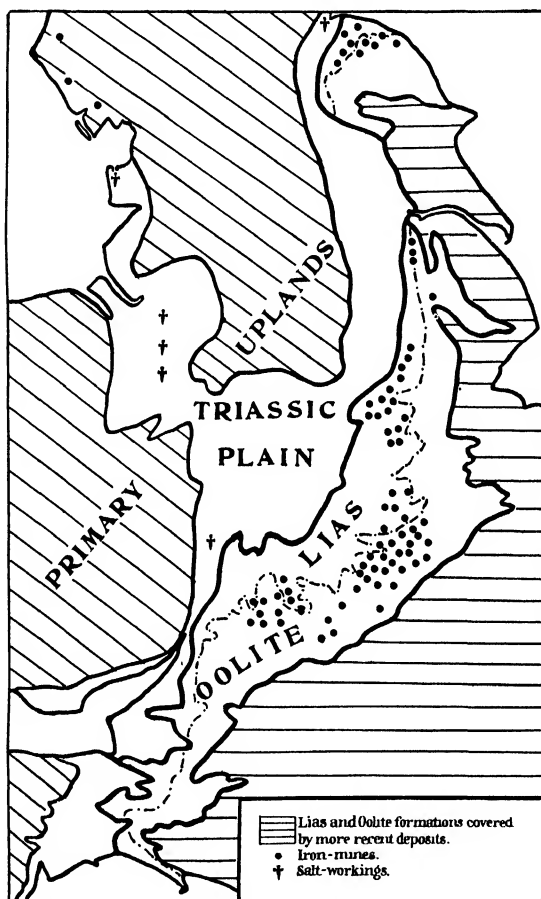


FIG. 80. SKETCH MAP OF PRINCIPAL SALT- AND IRON-MINES

pig-iron is produced in the North-east Midland furnaces of Kettering, Wellingborough, and the Leicestershire and Chesterfield districts. The other important smelting centres

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are in the South Wales and Cumberland coalfields, but the output of the Scottish and Black Country coalfields has declined to less than one-tenth of the total. The steel industry (output 7,300,000 tons in 1930) is chiefly centred in the coastal coalfields. More than one-fourth of the total output is obtained, however, from the industrial regions of North and South Staffordshire and Sheffield, nearly 4,000,000 tons of scrap-iron and ferro-manganese being consumed in addition to the pig-iron obtained from the blast-furnaces.

Road-building materials (6,000,000 tons) are quarried in granite and basalt areas, and slate in North Wales (250,000 tons). China clay is mined in the St Austell district (1,000,000 tons) and exported from Fowey and Charlestown for reshipment to the United States and Belgium, or sent direct to the Mersey for the Pottery District. Salt forms the basis of the great chemical industries of the Lancashire-Cheshire plain and the north-east coast—*e.g.*, at Billingham-on-Tees. Gypsum is extracted at Newark, and brick-earths are quarried at Peterborough and in many less important areas, though a considerable proportion of the British supplies of bricks and tiles is obtained from the estuaries of the Scheldt and the Rhine.

INDUSTRIAL AND COMMERCIAL DEVELOPMENT

Throughout the Middle Ages Britain was a purely agricultural country, entirely self-supporting in food, and exporting raw materials such as wool in payment for its imports. During the eighteenth century the woollen industry consumed the greater part of the domestic wool-supplies, and wheat and provisions were exported in return for oats and sugar. By the end of the eighteenth century British shipping was beginning to make great profits from the carriage of West African slaves to America, new possessions were being opened up in India and North America, and industrial machinery was being designed to make fuller use of the great coal and iron resources which have ever since remained the mainstay of British industry.

The population of England and Wales in the middle of

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the eighteenth century was about 6,000,000 people, and throughout the Napoleonic wars Britain was able to feed herself, and also to accumulate capital for further development from the profits of her industrial exports. Agriculture, however, remained the greatest British industry till about 1875, and up to the beginning of the World War the value of the food produced in Britain was almost equal to the value of the food imported. It is estimated that during the eighteenth century 2,000,000 acres of new land had been brought under cultivation by the reclamation of marshland and by the extension of enclosures into the Midlands. Increased yields per acre were obtained by the introduction of root crops, which cleansed the soil and increased the yield of crops per acre by being consumed as winter food, the manure being used as fertilizer. Enclosures made stock-breeding possible, and in the breeding of stock Britain still ranks with Holland and Switzerland. British pedigree stock is the basis of the best herds of the New World. From 1875 onward the most profitable branches of agriculture were those where specialization has taken place—*e.g.*, the breeding of pedigree stock for export and the production of milk and vegetables for densely populated urban districts.

During the nineteenth century the growth of industry based on cheap labour made it necessary for wheat to be bought in the cheapest market, and, except in the Eastern Counties, wheat was displaced by such products as milk, vegetables, and beef, which had fallen less in price. At first Russia and North-west Europe supplied the deficiency, but after 1860, when the great American railways were laid down, emigrants flocked to the United States, which took the lead, being followed by India, the Argentine, Canada, and Rumania, so that at the present time no less than 20,000,000 acres of overseas territory are occupied by wheat required for consumption in the United Kingdom. More than half of our wheat is now obtained from Canada.

Large-scale industrial development in Britain began earlier than in any other part of the world, and the application of steam-power gave to this country a long lead in the machinery and textile industries, which continued to the end of the

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nineteenth century. Great changes in the distribution of population accompanied the progress of industrialization, and first the iron industry and later the manufacture of textiles were concentrated on coalfields. By 1800 the most populous counties were Middlesex, Lancashire, the West Riding, Staffordshire, and Warwickshire, and the north-eastern part of the South Wales coalfield was beginning to develop iron industries. By 1851 the textile districts of Lancashire and Yorkshire obtained more people than London and the Home Counties, and iron industries had begun to attract people to the north-east coast. It is noteworthy, however, that as the textile workers of East Anglia were displaced they tended to migrate to London, and not to any great extent into the West Riding, while those of the West Country woollen districts made their way into South Wales, which continued as a centre of immigration till 1920. The towns that grew most quickly owed little to long-distance movements. The West Riding towns and the cotton centres of Lancashire and Cheshire drew chiefly on their own county areas and on Ireland, where the hand-loom industry was ruined.

The speeding up of production was due to the rapid development of inland transport, and canal, road, and railway systems followed each other in quick succession, so that by 1850 Britain had the finest system of inland communications in the world. Overseas trade had increased proportionately, and at the beginning of the nineteenth century large cargoes of slaves were shipped from West Africa to the cotton and sugar plantations of North America and the West Indies, which supplied Liverpool, Bristol, and Glasgow with important raw materials. London monopolized the Eastern trade in tea, silks, and spices, while the east and south coast ports engaged in profitable commerce with Continental Europe. The profits which began to accumulate fostered the development of banking and home industries and afforded surplus capital for investment overseas. During the eighteenth and early nineteenth centuries both London and Liverpool developed into world-*entrepôts*, importing bulk cargoes and re-exporting mixed cargoes. The conditions

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which give rise to *entrepôt* trade are as follows. (i) The surrounding country should be sufficiently fertile to support a considerable population to form a local market, and to provide a labour-supply sufficiently great to keep down the cost of working the port to a minimum. (ii) There should be a first-class system of land-routes and regular shipping

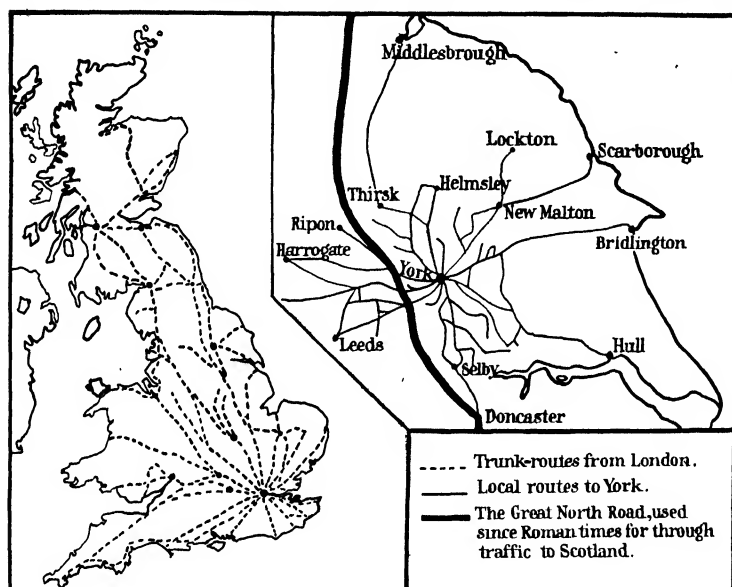


FIG. 81. MOTOR-ROUTES IN 1928

The centres of such routes have become increasingly important as distributive markets.

services centred in the port. (iii) There should be adequate warehouse accommodation for the goods which are to be transhipped. This involves an easily defended situation, possessing level land for docks and warehouses. (iv) Dock dues and tariffs should be relatively low. (v) The goods assembled at the *entrepôt* should be small in relation to their value—e.g., spices, drugs, silks, curios, ivory, furs, teas, and bullion. The existence of a local market for any of these would give the *entrepôt* an advantage over others which merely export them. (vi) The goods should be those which

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can easily be stored for a time without deterioration. (vii) There should be a sufficient accumulation of capital to finance the storage and redistribution. (viii) The *entrepôt* port should lie at the junction of world-routes, though the great value of the goods stored makes the freight rate insignificant and long and tedious journeys no great handicap. Formerly specialized knowledge of markets was possessed by only a few towns, such as Constantinople, Venice, Lisbon, Antwerp, and London.

THE DECLINE OF WORLD-ENTREPÔTS

As long as one nation monopolized ocean trade it was most advantageous for other countries to buy where most goods were stored, but with the growth of independent mercantile marines direct buying became possible. With the rise of independent industries other countries began to import raw materials direct, and with the introduction of the telegraph and submarine cable many ports became independent of the London market. Eventually wireless telegraphy made it possible for cargoes to be bought and sold and redirected to a new destination.

The great development of commerce brought about by the increased size of ships and the provision of liners made it possible to grade goods at their source for direct shipment as bulk cargoes. This method is found to be the cheapest for such cargoes as cotton, grain, and coal, but ungradable goods still make use of the world-*entrepôt*.

During the greater part of the nineteenth century Liverpool was the great world-*entrepôt* for cotton and London the chief international market for wool. The poorer European nations were able to purchase small amounts of raw material from these centres, but with the development of large independent textile industries, the building of their own commercial fleets, and, above all, with their increased financial independence, foreign countries were able to obtain their cotton shipments direct through Havre, Antwerp, and Bremen. This is because cotton can be accurately graded, and break of bulk at Liverpool is unnecessary. The conditions with respect to wool are different because of the im-

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possibility of grading. Wool varies in quality according to climate, breeding, food, and clipping; moreover, it is impossible to estimate exactly what percentage of pure wool can be obtained from the fleece until the grease has been removed, and as the cleaned wool cannot be carried in bales without felting it is more convenient for the wool to be conveyed in a greasy condition to the world-*entrepôt*, where it is sold to expert wool-buyers. Thus, London still retains its dominance in the European wool market, though Sydney also has its wool sales, to which buyers come to obtain supplies for America and Japan. Similar conditions operate in the case of tea and other commodities which must be examined before purchase.

The chief importance of the *entrepôt* ports at the present day lies in their price-setting function, and their financial market is the supreme court of commerce. This is because centralized buying is economically advantageous. It should be noted, however, that as other countries accumulate capital the influence of the international trade centre tends to decline. In the case of London the sale of British foreign investments during the War allowed New York to displace London as the chief financial centre of the world.

During the peace which followed the Napoleonic wars the population of Britain rapidly increased, and the abundance of coal and iron near the sea-coasts made Britain the greatest, practically the only, industrial Power in the world. The modern position of the United Kingdom, with its great dependence on the outside world for food and raw material, and for the marketing of its manufactures, led to the adoption of what is virtually a free-trade policy, as it was felt that any restrictions in trade might tend to paralyse industrial expansion. Britain's position as the greatest shipbuilding and ship-owning country dates from the substitution of steam for sailing power and of iron and steel for wood. By 1900 the British Empire's shipping tonnage had grown to more than 10,500,000 tons, and until the outbreak of the War Britain was the ocean-carrier of the world.

The carrying trade depended on three factors. (i) Britain's strong industrial position was based on free access to world-

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markets for foodstuffs and raw materials. (ii) The Empire possessed a large number of well-distributed coaling-stations and ports of call. (iii) The coal-export trade made it possible for British ships to secure return cargoes by quoting relatively low freights. These factors secure low cost of construction and operation, and in 1914 30 per cent. of the overseas trade between foreign countries was carried by British ships. A carrying trade could be maintained without the backing of strong home industries and of coal exports, but its position would then be precarious; the future of British shipping depends to a great extent on Britain's industrial position. Before the War British shipping carried more than half the sea-borne traffic of the world, including the greater part of the trade between the Empire and foreign countries. Its insular position tended to detach the United Kingdom from the economic life of Europe, and to divert its activities into the more distant markets. Three-fifths of Britain's trade is with non-European countries; 90 per cent. of the 51,000,000 tons imported consists of food and raw materials, the chief of which are timber, grain, ores, textile raw materials, and petroleum, valued at £367,000,000 sterling in 1928. The outward cargoes are coal (55,000,000 tons) for European markets and manufactured goods, which find a market in every part of the world. Three-fifths of the British exports go to Africa and the East, and two-fifths to America, but in the case of imports these values are reversed—60 per cent. of the imports coming from America and 40 per cent. from the rest of the world. It is therefore impossible to maintain a balance of outward and return freights in the North Atlantic trade as the cargoes of grain, meat, dairy produce, sugar, and fruit imported occupy much more cargo space than the wool, hides, machinery, and pedigree stock exported to America. Before the War emigrant traffic did much to maintain a balance, but since 1918 not only has the United States limited the number of European immigrants, but much of the European emigrant traffic no longer uses British ports. The trade balance of the United Kingdom was formerly maintained by Asiatic exports to America, but since the War India is no longer a free market for British goods, and the internal condi-

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tion of China limits that country's importance as a market for European goods and its capacity for producing goods for the American markets. Moreover, the opening of the Panama Canal has brought the whole of the Pacific, from Singapore eastward, within the sphere of American trade, and New York tends more and more to displace London as the source of manufactured imports, and British firms, such as Cadbury's and Lysaght's, have found it necessary to establish branches in Australia in order to protect their trade against American competition.

During the War British ships were withdrawn from the Pacific, and Japan improved her position in the trade with China, while the coasting trade of Chile and Peru became national monopolies. Nevertheless, the total tonnage of British shipping is greater than at the beginning of the War, when it was 19,000,000 tons. The proportion of the world's shipping owned by Britain has decreased from 44 per cent. to 31 per cent., while that of the United States has risen from 4 per cent. to 22 per cent. The value of Britain's overseas trade in 1926 was £267,000,000 sterling.

PHYSICAL REGIONS

1. The **highlands of the north and west** consist of Archæan and Primary rocks, which form the Scottish Highlands, the Southern Uplands and Pennines, the Cumbrian and Cambrian uplands, and the South-western Peninsula.

The Scottish Highlands consist of Archæan rocks and a large area of igneous rocks. The Highlands are separated from the Southern Uplands by the Midland Rift Valley, where down-faulting has preserved the coal measures in several places. The hard surface of the Highlands has been eroded into deep valleys, where small-scale cultivation supports little groups of people. The higher ground is pastoral. Glaciers, rivers, and crustal movements have played their part in producing the present relief, which is that of a highly dissected plateau whose main south-west-north-east folds have long since disappeared, though the Caledonian trend lines are revealed by the courses of the streams. On the

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west the Highlands end in a series of deep sea lochs, which are true fiords.

The Midland Rift Valley is bounded on the north by the steep trenched wall of the Highlands, but merges more gradually on the south into the Southern Uplands. Here and



FIG. 82. PHYSICAL REGIONS OF THE BRITISH ISLES

1, Scottish Highlands; 2, Central Lowlands of Scotland; 3, Southern Uplands of Scotland and northern uplands of England; 4, Welsh uplands; 5, South-western Peninsula; 6, English plain; 7, north-western highlands of Ireland; 8, north-eastern uplands of Ireland; 9, south-eastern uplands; 10, south-western uplands; 11, central plain of Ireland

there intrusive igneous rocks have resisted erosion and stand out as hills. The Southern Uplands and the later fold of the Pennines are lower than the Scottish Highlands, comprising rounded grass- or heather-clad hills, which form good pastoral country with arable land in the valleys. The broad dales of North-west Yorkshire and South-west Scotland are important for cattle as well as for sheep. There are relatively few gaps through the uplands between the east and west coasts, and the roads and railways crowd into the low

passes at the heads of the Clyde, Tweed, Tyne, Tees, Aire, and Calder valleys. Near the Scottish Border there are only two easy north-south routes along the coastal lowlands, so that either Carlisle or Berwick must normally be passed in a journey between England and Scotland. Several other pack-horse routes were used in the former Border forays, and these

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gave rise to a number of small fortified towns—*e.g.*, Sedbergh and Coldstream. Several of these minor routes now afford heavily graded ways for roads and railways. The districts of most economic importance are the coalfields found on the edges of the upland districts.

The Cumbrian uplands, or Lake District region, is a deeply dissected dome of ancient rocks with lava flows which occupies practically the whole of the area between the Pennines and the Cumberland coast. The central fells are composed of slate and igneous rocks which yield soils deficient in lime and therefore generally unsuitable for cultivation. The greater part of the upland mass is purely pastoral country. In the north, between the Lake District and the Northern Pennines, lies the fertile Vale of Eden, where more than a quarter of the area is under the plough. The Welsh uplands are also pasture-lands, and range in age from the Archæan rocks of the Longmynd to the coal measures and Triassic rocks of the Welsh borders. The South-western Peninsula contains two great blocks of moorland—Exmoor, in the north, and Dartmoor, in the south.

2. The **English plain** covers Britain south of the Pennines and Southern Uplands and most of the Cambrian mountains. It consists of three chief areas, the Triassic plain, the south-eastern scarplands, and the Tertiary and Quaternary basins and coastal plains. In plan the Triassic plain resembles a wish-bone, beginning near Sidmouth, in Devon, and widening out north of Worcester into the Midland lowlands and the Lancashire-Cheshire plain and the vale of York. It reaches the Irish Sea near Fleetwood and the North Sea at the mouth of the Tees. "The edge of the Trias is one of the great boundary lines in England. Beyond it the landscape changes, and with it the utilization of the land, and, to some extent, the type of people."¹ In many respects the Triassic zone is transitional between the agricultural and the pastoral parts of Britain. In some parts the coal measures are worked under the Trias, so that there is an overlapping of industrial and agricultural regions, especially in the Doncaster district, where a number of the largest coal-mines occur immediately

¹ Sir John Russell.

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below highly productive arable farmland. Mining for salt is also carried on in several parts of the Triassic plain, and especially at Northwich and Fleetwood and at Greatham, on the Tees mouth.

The English plain is not horizontal, but has been tilted downward to the south-east, weathering into a series of escarpments where harder rocks have resisted erosion. Certain gentle folds have also occurred. Except on the scarps the south-east of England lies near sea-level. The Jurassic zone contains two important rock systems—the Lias and the Oolite. The Lower Lias clays form fertile lowlands, but, as a rule, this heavy, dark, green-brown soil demands too much labour to be worth cultivating for cereals. At the present time, therefore, it is left under grass and used as pasture-land for meat and pedigree cattle. To the east the Lias disappears under the Oolite, which stretches from Cleveland to Blackdown, in Dorset. The Oolite escarpment reaches 600 to 800 feet above sea-level, but is not continuous. The limestone of the Inferior Oolite can be cut easily, and is of great value as a building stone of greater durability than Magnesian Limestone, which is sometimes preferred because of its white colour. The Oolite is generally under sheep, though the number of dairy cattle is increasing. It is separated from the chalk escarpment by clay vales, and, though the proportion of land under cultivation increases toward the south-east, the crops grown are chiefly cattle crops, and there is a definite tendency toward specialization in milk production, with pigs as a by-product.

The chalk escarpments have lighter soils, more suitable for barley than for wheat. Nevertheless, the slopes of the chalk hills form some of the chief wheat-producing areas of England, sheep being used for manuring and treading in the fields. The sheep-wheat farms of the English, with their carefully worked rotations of crops, are practically unique in European agriculture. Several lowland basins occur within the chalk. The chief of these is the Fen District, which, with parts of the Ouse-Trent basin, consists entirely of alluvial soils reclaimed and drained since the seventeenth century. Unlike the chalk districts, the Fens possess deep

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black soils, which produce heavy crops of grain, potatoes, and mustard. For economic reasons sugar-beet tends to replace potatoes, which cannot stand high transport charges.

Deep soils also occur in the Tertiary basins of Hampshire and London. These vary in quality, but are generally fertile. Market-gardens, small fruits, and flowers occupy much of the sandy soil, which was formerly too sterile for cultiva-

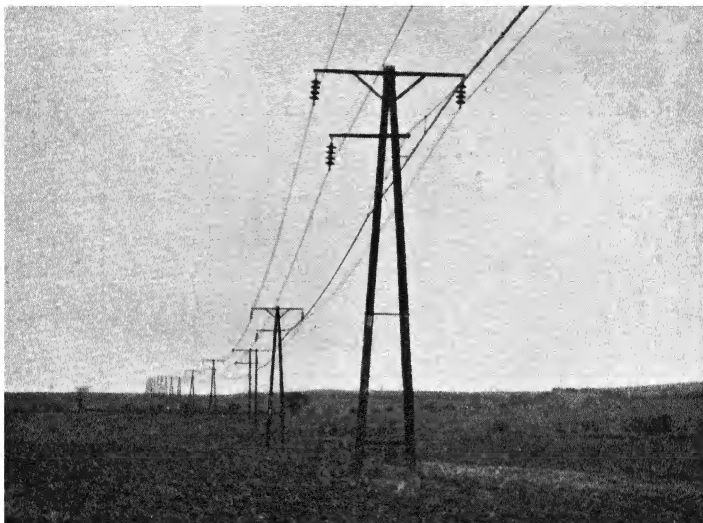


FIG. 83. OVERHEAD POWER LINES (66,000-VOLT) NEAR DUNSTON-ON-TYNE

By courtesy of Messrs W. T. Henley's Telegraph Works Co.

tion, but the heavy clays are generally used as pasture for cattle. The brick-carths of the London basin are easy to cultivate, and probably formed the earliest centres of settled village life.

In many parts of Eastern England glacial and alluvial deposits have made certain districts specially fertile, and cattle are kept not only because of the high reputation of fresh and home-fed meat, but also in order to maintain a sufficient supply of farm manure for cultivation. This has

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tended to keep the people together in villages, in contrast to the scattered farms which are found in many parts of Continental Europe.

The twofold division of Britain has had other consequences. Up to the beginning of the nineteenth century the bulk of the food consumed was produced locally, with the result

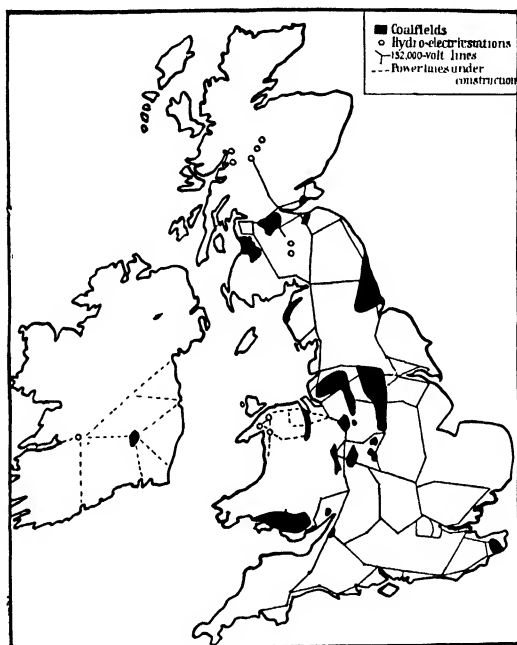


FIG. 84. PROJECTED ELECTRIFICATION OF THE BRITISH ISLES

that the population of England was densest in the south-east and that of Scotland in the Central Lowlands. Most of the important towns were in South-east England, and they owed less to special geographical advantages than those of the north and west. As a rule the towns of Metropolitan England enjoyed many-sided activities and an economic stability which the more highly specialized industrial towns which grew up on the coalfields during the nineteenth century

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did not possess. The result is that at the present day unemployment presses less heavily in the south-east than in the north-west, and the most urgent problems of to-day are to create new industries in the coalfields and to make the labour-supply more mobile. Since the beginning of the present century there has been a definite shifting of many industries from the "industrial North" into the "agricultural South," and the time is not far distant when the power obtained from the British coalfields will be capable of application in nearly every district. This may eventually lead to the decentralizing of many of the industries which at the present time depend chiefly on their nearness to coal.

The widespread development of electrical power will cause industries to be localized where land is cheap and rates and taxes are low. Export manufactures will be attracted to the neighbourhood of the great ports, while industries producing chiefly for the home market—*e.g.*, artificial silk—will remain at inland points which possess good communications by road and rail. Britain's position in this new industrial revolution is illustrated by the following table for 1929:

COUNTRY	TOTAL CAPACITY IN MILLIONS OF KILOWATTS	OUTPUT IN MILLIONS OF UNITS
U.S.A.	37·5	126,000
Germany	12·4	30,660
Canada	4·3	17,628
Great Britain	9·3	16,900
France	7·5	15,000
Italy	4·1	10,800

CHAPTER XXI

THE BRITISH ISLES: ECONOMIC SUB-REGIONS OF BRITAIN

To a very large degree the economic sub-regions of the British Isles correspond to the physical regions. The development of the coalfields between 1750 and 1850 had the effect of localizing heavy industries in the coalfields, but with the exception of South Wales, North Stafford, and Lancashire immigration to these fields was confined to the neighbouring countryside. The West Riding attracted its workmen from the agricultural districts of Yorkshire, while the weavers displaced in East Anglia went to London, and not to Leeds. The Irish hand-loom industry was ruined, and many Irishmen found employment in Lancashire, but in many districts industrial development was held up by the absence of agricultural workers. This was particularly the case in Durham and South Wales, where the local woollen industry came to an end owing to the relatively high wages of the coal and iron industries, which attracted local labour in addition to large numbers of persons of other districts who possessed no knowledge of textile manufacture. This is the chief reason for the absence of large-scale textile industries in the South Wales and Durham coalfields, but it should be noted that one or two small woollen mills were still working in these areas before the outbreak of the World War.

The Primary uplands have many characteristics already noted in similar areas of Continental Europe. In each case they are regions incapable of supporting more than a limited number of stock, and are either too barren or too wet for cereal crops. Wheat is seldom grown 800 feet above sea-level, and there is practically no cultivation above 1000 feet. In Ireland the upper limits of cultivation are even lower. In the past these circumstances imposed a limit to the number

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of inhabitants who could live in upland districts, and overcrowding was followed by raids into the lowlands, and in later days by the development of manufactures and by the emigration of the younger folk.

I. THE SCOTTISH HIGHLANDS

The Scottish Highlands are a highly dissected plateau of Archæan and igneous rocks, with Old Red Sandstone in the east. The greater part of the surface, however, consists of metamorphic rocks. The region occupies two-thirds of the total area of Scotland, and is separated from the Central Lowlands by a boundary fault which stretches from Stonehaven to Helensburgh, on the Clyde.

More than 14 per cent. of Scotland lies above 1500 feet above sea-level, and here the rainfall is too heavy and the summer too cool and short for cereal cultivation. There is little mineral wealth and coal is absent. Consequently large areas are uninhabited, and the crofters of the north-west coast can maintain themselves only by combining fishing and small-scale farming. In very favourable circumstances the density of population may reach fifty persons per square mile, and this figure includes the fishermen who migrate with the power-fishing fleets, accompanied by their wives and daughters, who clean the fish landed at Wick and at the east coast ports as far south as Lowestoft, a case of 'transhumance' comparable with that of the people of the Alps.

The isolation of the villages makes them almost entirely dependent on their immediate locality for good building material and clothing. A hand-loom industry produces small quantities of Harris and Lewis tweeds, but practically the whole of North-west Scotland is under pasture of a poor quality, more suited to sheep than to cattle. Glenmore is a flat-bottomed, narrow valley which separates the Northern from the Central Highlands, but, apart from its containing small patches of Old Red Sandstone soils capable of cultivation, it has little economic significance at the present day. Its forts were constructed to maintain Hanoverian rule during the eighteenth century, but its towns, Inverness

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(22,000 inhabitants) and Fort William, are important only as local markets and railway centres.

Along the north-east coast, round Moray and Dornoch Firths and in the plain of Caithness, there is a narrow belt of Old Red Sandstone soils which supports crops of oats, turnips, and grass. Elsewhere the north-east coast depends largely on the fisheries. In the Central Highlands the poorer pastures were formerly held by the clans, each clan holding its lands in common. During the Industrial Revolution the demand for wool led to the clearance of many of the hamlets and to the scattering of the Highland folk in the new colonies overseas. Many, doubtless, found a more permanent home in the Central Lowlands of Scotland, but others who were driven out settled in Canada, Australia, and New Zealand. The increased output of Australian wool-supplies checked the further extension of the sheep-runs, and large areas are now maintained as deer forests, grouse moors, and preserved fisheries, let at high rents to sportsmen. Recently there has been a considerable development of hydro-electric power—*e.g.*, at Kinlochleven—but the absence of a local population and the great distance from possible markets for electric power has limited its use to the production of aluminium. Reafforestation would do much to improve the economic productiveness of the whole of the Highland region, especially in the west, where the climate is equable and wet and conveniently fit for either spruce or Douglas pine.

Aberdeen (167,000 inhabitants) is the only large town in the Highlands. Surrounded by fertile country at the outlet of the Dee and Don valleys, it exported wool, hides, and salmon to Bruges and Danzig during the Middle Ages, and in course of time developed a flourishing woollen industry, which produced cloth during the seventeenth century and hosiery at a later date. The absence of coal caused the woollen industry to decline, and for a time the chief industry was fishing and whaling. Norwegian timber was imported during the early years of the nineteenth century for the building of wooden ships, but this industry has declined, and steel trawlers are built instead. The chief imports are petroleum, wheat and flour, and wood-pulp used in the local

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paper industry. Coal-supplies are obtained by coasting vessels. The chief export is fish, which is landed from trawlers and drifters, cured, and exported to the Baltic countries, Aberdeen being the second fishing-port in Britain. Granite is also quarried for export.

II. THE CENTRAL LOWLANDS OF SCOTLAND

The combination of superior communications, local fertility, and extensive coalfields has given rise to a high density of population between the Highlands and the Southern Uplands. The Rift Valley occupies a north-east-south-west trough about fifty miles wide and broken by ridges of igneous rocks, which rise to between 1500 and 2000 feet above sea-level in the Ochil, Sidlaw, and Pentland Hills and in the Campsie Fells. There are also a number of isolated volcanic stumps, such as Arthur's Seat and North Berwick Law. These hills have influenced the direction of routes and the sites of the older towns, especially in the cases of Edinburgh, Perth, and Stirling.

Between the midland hills and the Highlands lies the Old Red Sandstone plain of Strathmore, which has less than one-fifth of its area under permanent grass. The area under grain is again decreasing, but Strathmore produces fine crops of oats, barley, roots, and potatoes, while the district of Blairgowrie is important for raspberries, and sugar-beet has been successfully introduced. In this area agriculture does not aim at supplying local needs, but in producing seed-plants, such as potatoes and wheat, for export to other districts. Much of the beef is also sent to distant markets, though the old droving trade to East Anglia is no longer carried on by road. The fattening of cattle is the most important branch of agriculture, and to this end a great deal of feeding material is imported. Cattle are also bred for export to the Argentine ranches. The effect of the War was to cut off the supply of imported sugar and cattle fodder, and for a time the area under wheat and dairy crops was extended. Wheat is no longer grown for local consumption, but the dairy industry is firmly established. Flax was

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formerly important in Strathmore, but with the establishment of a Baltic trade this crop almost disappeared.

For many centuries the peninsula of Fife was less accessible from the rest of Scotland than from Continental Europe, and a self-supporting agriculture was developed.

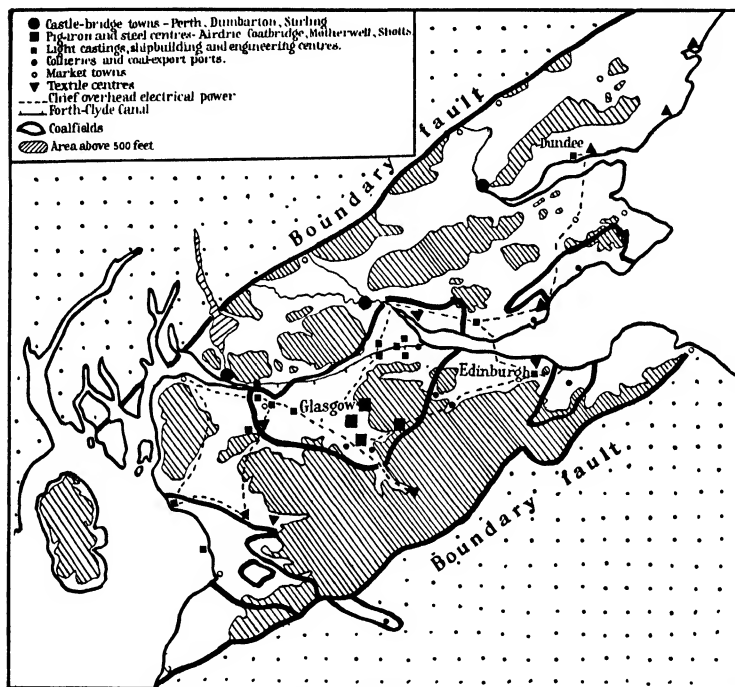


FIG. 85. THE CENTRAL LOWLANDS

The linen and linoleum manufactures are the direct descendants of the old hand-loom industry, but the raw materials are now imported. The coasts and the Vale of Eden are intensively cultivated, wheat and potatoes being important. In the south, especially in the hill-girt amphitheatre which encloses Loch Leven, more than half the surface is under sheep and cattle, while the south coast produces milk for the colliery districts. The eastern coastal villages have

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always engaged in fishing, and St Andrews, which possesses the oldest Scottish university, was formerly in intimate commercial relationship with France. At the present time it is chiefly known as the headquarters of the golfing world.

Fifeshire produces more than one-fifth of the coal output of Scotland. Of the 8,000,000 tons raised three-fifths are exported, the chief port being Burntisland, which prepares alumina for Kinlochleven and Methil, in tonnage the fourth greatest Scottish port. Some of the coal is used in the linoleum manufacture of Kirkcaldy (44,000 inhabitants) and in the iron industry of Dunfermline (35,000 inhabitants). Dundee (175,000 inhabitants), the third city of Scotland, also uses Fifeshire coal. During the early nineteenth century its linen industries used flax obtained from the Baltic. With the outbreak of the Crimean War and the withdrawal of the bounty on home-grown flax, hemp and jute were used instead, and at the present time 14 per cent. of the world's output of jute cloth is produced at Dundee. This cloth is used chiefly for export and in the oilcloth and linoleum industries. Dundee is an example of human skill and enterprise being the principal factors in the localization of industry, neither the coal nor the raw materials—iron, flax, jute, and oranges—used being produced locally. Moreover, the products of its engineering, jam, and textile industries are intended for distant markets.

As in Northern England, the more ancient towns of the Tay and Forth basins grew up round castles and monasteries, and Scottish agriculture owes much to the intelligence and energy of the monks. Unlike Northern England, however, a more intimate contact was maintained with France and with Norway. The chief towns of the Tay and Forth valleys are Perth (35,000 inhabitants) and Stirling (22,000 inhabitants), which lie at points where routes converge at the lowest ford or bridge. Perth is the gateway of the beautiful Tay valley, the soft waters of which are used in the local dyeworks. Lying between the fertile vale of Strathmore and the Carse o' Gowrie, Perth is an important market, and for a time was the capital of Scotland. Stirling's strong position made it an important military centre during the Middle

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Ages, and at the present time its nearness to the Forth coalfield supports the local woollen, iron, and brewing industries. Grangemouth imports pig-iron from the Tees for the steel industries of Lanark.

More than 1600 persons per square mile are found in Lanark, and the Clyde-Forth industrial region is one of the most densely populated districts in Europe. The South-eastern Lowlands, especially Midlothian, is a zone of arable farming, the chief crops being oats, hay, turnips, seed-potatoes, and wheat. The south-west is damper, and Ayrshire is excellent dairying country, the milk being marketed through co-operative creameries. Potato-fields are fertilized by means of seaweed along the sandy coast south of Ayr, and especially near Girvan. Ayrshire produces more than a tenth of the coal output of Scotland, and besides dominating the economic life of the south-west supplies a surplus for export to Ireland. Local manufactures, such as the carpet industry of Kilmarnock and the shoe industry of Maybole, have survived from the age of handicrafts, but the more important industries, cotton-spinning and engineering, are of modern origin.

The early development of agriculture and commerce round the Forth and Clyde estuaries gave rise to numerous local industries which utilized both locally produced and imported raw materials. The development of North American and East Indian trade brought the Clyde into intimate relation with Britain's early colonial empire. This accounts for the sugar-refining industry of Greenock (79,000 inhabitants), for the tobacco factories of Glasgow, and for the cotton-mills of a number of centres—*e.g.*, New Lanark, Paisley, and the upper Irvine valley, where water-power was originally used. Wherever arable land occurs oats and roots are grown for dairy cattle, while in the upper Clyde district horse-breeding is important. The chief industry, however, is the manufacture of iron and steel goods, and especially of ships and machinery. The original centre of the Scottish iron industry was Falkirk, on the Carron river, where local iron ore, timber, and water-power gave rise to manufactures on a sufficiently large scale to satisfy the needs of medieval Scotland.

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The discovery that the blackband ironstone of the Clyde valley could be smelted either alone or with the hard splint coal of Airdrie and Coatbridge caused the iron and metal industries to spread westward to the Clyde. At the present time the dependence of the iron and steel industry on imported ores has caused the growth of steel-works at Motherwell, but for a long time the Dalry-Muirkirk district of the Ayr coalfield was the chief iron-mining centre and the iron industry was widespread. Now Dalry has also to depend on foreign ore. In the south-west of the Lanark coalfield Hamilton began coal-mining too late to find a place in the iron industry.

It was to serve the expanding coal and iron industries that the Forth-Clyde and Monksland canals were constructed during the great period of industrial expansion, 1800-40. Incidentally the Forth-Clyde Canal was used for the early experiments in steam navigation, which led indirectly to the great shipbuilding industry of the Clyde. The depth of the river at Clydebank facilitated the establishment of large modern shipyards at this point. Scottish emigrants provided an outward cargo to America, and bulk shipments of imported grain made for the cheapening of Scottish steel and the localization of shipbuilding on the Clyde. Early in the nineteenth century the river was dredged as far as Glasgow, and this enabled that port to survive. Shipbuilding, however, is chiefly carried on at the outports of Clydebank (47,000 inhabitants), Dalmuir, Dumbarton (22,000 inhabitants), and Govan (90,000 inhabitants), which together produce about one-third of the total tonnage of British-built ships. Though the Tyne ports launch a larger proportion (40 per cent.) of British ships many of these are brought to the Clyde to be fitted and tested, and the Clyde may justly claim to be the greatest shipbuilding centre in the world.

Many other metal industries are localized in the iron and steel centres, while there are a number of glass-works and paper-mills.

Before the blackband ironstone district was developed the Clyde valley had a number of cotton-mills using local water-power. In 1840 cotton was the staple industry, and there

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were more than a hundred and twenty mills within twenty-five miles of Glasgow. Dyeing and bleaching were carried on in the Leven valley at Dumbarton, and chemicals manufactured on the Forth-Clyde Canal. Men's wages, however, were low, and hand-loom weaving continued after it had become unprofitable elsewhere. Emigration to New England, the stoppage due to the American Civil War, and the utilization of most of the available capital in the iron industry held up the process of modernization until it was too late, and to-day the remaining cotton-mills centred in Paisley and other smaller centres consume less than one-tenth of the cotton imported into the United Kingdom. Even then the cotton industry is highly specialized, and consists chiefly of the making of cotton thread.

Glasgow (1,100,000 inhabitants), which grew up round the ford marking the limit of tidal navigation, was the junction of routes connecting the Highlands, the Southern Uplands, and the Western Lowlands. Two low passes connect it with Ayr; the Clyde valley gives perfectly easy routes to the south coast and the Tweed valley; while eastward there are broad tracts along the Kelvin stream and South Calder which give communication with Stirling and Edinburgh. Because of the small amount of trade in the Western Lowlands the lowest bridge-town was of little importance before the Act of Union (1707) opened the North American Colonies to Scottish traders. Scottish resident factors developed the tobacco plantations of Maryland and Virginia, and the Glasgow merchants controlled more than half of the eighteenth-century tobacco trade of Britain. With the loss of the American Colonies sugar and rum from the West Indies took the first place in foreign trade, being exchanged for herrings. Toward the close of the eighteenth century the invention of the cotton-gin made cotton cheaper than linen, and cotton manufacture became the chief industry of the Glasgow district. A long series of inventions made Glasgow the great market for the rapidly expanding engineering industries. The War saw the period of maximum expansion, but was followed by a severe post-War depression. This is being met by the creation of a super-power zone. Already 670,000 horse-power

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capacity has been installed by the linking up of the steam-power stations with the hydro-electric works on the Clyde and progress has been made with the Grampian scheme. It is estimated that by 1940 one million horse-power will be available, and that the cost of electricity will be reduced to a halfpenny per unit. This represents a saving of 40 per cent. of the power used in shipbuilding, and should enable

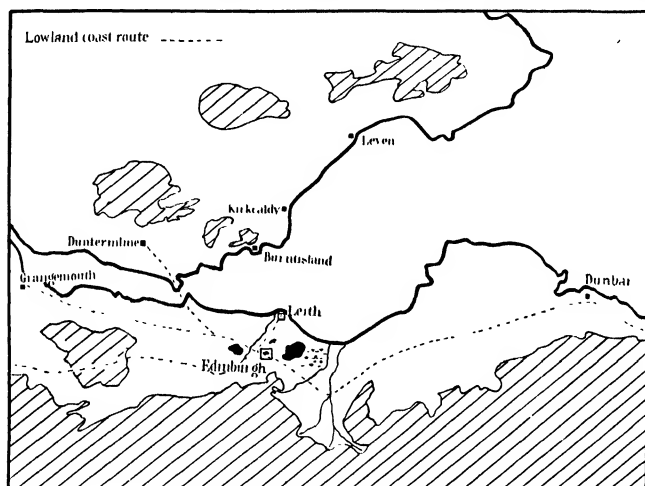


FIG. 86. THE SITE OF EDINBURGH

Note how the Castle Rock, round which Edinburgh grew, commanded the lowland coast route (.....) from England into Central Scotland.

other industries to be modernized. At the present time the Falls of Clyde, used for more than a century for the cotton industry of New Lanark, are being harnessed for the production of hydro-electric power in connexion with the reorganization of electrical supply in Central Scotland. The annual output of the Scottish coalfields is about 36,000,000 tons, and of this the Lanark field produces 40 per cent., the Stirling-Linlithgow area 14½ per cent., and the Lothians 12 per cent. Thus the industrial triangle Edinburgh-Dundee-Glasgow has about 24,000,000 tons of coal available for the production of mechanical power and for chemical and metallurgical industries.

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Edinburgh (439,000 inhabitants) originated where hills command the narrow lowland strip between the Pentland Hills and the sea. Castle Rock defends the passage between Arthur's Seat and the Pentland Hills, and its fortification made it the key of Scotland's independence. The early growth of Edinburgh was due to local fertility, and important markets for cattle, sheep, and corn were held under the protection of the castle. Foreign trade developed through the port of Leith, especially with France, who supplied wine in exchange for wool and dried fish. The fishing, wine, and shipbuilding industries required timber, and a considerable import trade developed, which gave rise to the making of paper and of casks for wines and spirits. As Scotch whisky was improved through blending and maturing less wine was consumed, and whisky has displaced brandy at Leith, the chief centre for rectifying and export. Since 1603 direct trade between Leith and France has relatively declined, while that with Denmark and the Baltic has greatly increased, coal being exchanged for timber, dairy products, and flax.

The old sailcloth industry persists in an altered form in the production of canvas blinds, tents, and marquees. Paint and varnish industries utilize imported oil-seeds, while the making of tarpaulins combines the canvas and oil industries (*cf.* Hull). Edinburgh's great importance, however, is due to its being the capital of Scotland and the centre of the east coast railways. The development of its industries—paper-making, brewing, and distilling—was due to the opening up of the Lothian coalfield after the building of the Union Canal, which connects Edinburgh with the Forth-Clyde Canal. The rubber industry, however, owes its localization to the fact that it was originally American and excluded by patent law from England. Engineering is also important. A relatively large proportion of Edinburgh's population consists of professional and commercial classes.

Up to the outbreak of the World War the oil-shale industry of Linlithgow and Midlothian, which is centred in Bathgate and West Calder, was able to compete with imported oil because of the value of the by-products and because of

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Scotland's remoteness from Russia and the United States. Of the 3,600,000 tons of oil-shale mined in Europe, more than nine-tenths were raised in Scotland. Since the War Grangemouth has begun to refine imported oil and the oil-shale industry has commenced to decline. The Lothian coal-field supplies local industries.

III. THE UPLANDS OF SOUTHERN SCOTLAND AND NORTHERN ENGLAND

To the south of the Central Scottish Lowlands a series of dissected uplands extending almost from coast to coast separates the agricultural plains of Scotland and England. Their unproductive nature has created a barrier between the more densely populated parts of Britain, and it delayed the political union of Scotland and England. Everywhere the population of the hill masses is scanty, but there are several deep fertile valleys where agriculture supports a number of small towns.

The Southern Uplands of Scotland consist of a large island of Silurian and Ordovician rocks rising to more than 2500 feet above sea-level in the Moffat Hills and continuing to the south of the Tweed in the heather-clad intrusive igneous block of the Cheviots. Numerous volcanic dikes penetrate the older rocks, and in the case of the Great Whin Sill the igneous rock forms the footing of part of the Roman Wall between the Solway and the Tyne. Two lowland areas are found in the Southern Uplands—the Tweed valley and the Galloway-Solway plain. In the latter there is abundant, well-distributed rainfall, and the growing season is considerably longer than on the east coast. The south coast of Scotland has always been noted for cattle, but dairy-farming has displaced stock-raising as the premier industry, the milk being collected in lorries by co-operative societies for dispatch to Newcastle, Lancashire, Birmingham, and London. Cheese, butter, and margarine are made, and a pig-rearing industry has been started. To the west of Wigtown the farms are somewhat remote from main routes, and cheese is more important, but everywhere near the trunk railways milk and butter are more important. Buildings are constructed of

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grit and granite, and the frontier nature of the region is well illustrated by the numerous fortified dwellings and ruined castles.

Toward the east the Solway plain has been partially reclaimed and brought under cultivation, but the chief arable

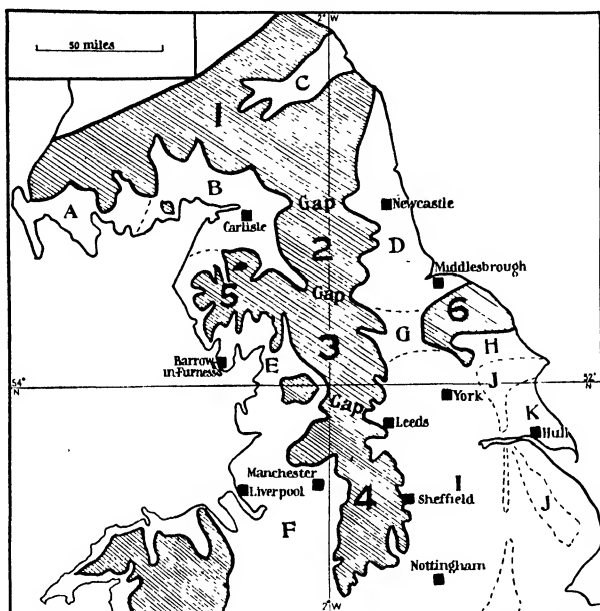


FIG. 87. THE UPLANDS OF SOUTHERN SCOTLAND AND NORTHERN ENGLAND

1, Southern Uplands; 2, Northern Pennines; 3, Central Pennines; 4, Southern Pennines; 5, Cumbrian uplands; 6, North Yorkshire moors.

A, Galloway lowlands; B, Solway Plain; C, Tweed valley; D, North-umbrian plateau; E, North Lancashire plain; F, Lancashire-Cheshire plain; G, Vale of Mowbray; H, Vale of Pickering; I, Ouse-Trent basin, J, the Wolds; K, Holderness plain.

areas occur in the dales of the Nith, Annan, and Esk rivers. Mixed farming is general, but the hill country is chiefly under sheep. Dumfries (23,000 inhabitants) is the chief market, with woollen, linen, and silk industries.

The Eastern Lowlands basin is drained by the Tweed, and has formed the gathering ground for many invasions across

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the English border. The whole of the economic development of the Tweed valley has been conditioned by its nearness to the frontier, and cattle-raiding was one of its chief industries until a comparatively late period. Agriculture was fostered by the relative dryness of the climate and the fertility of the Old Red Sandstone soils allowed wheat, peas, and flax to be cultivated, while the river had a plentiful supply of salmon. Wool and hides were exported from Berwick, and gradually there developed a woollen industry based on water-power and locally produced fleeces. The loss of Berwick, the only port for overseas trade, held back the industrial development of the basin until the age of railways, and the absence of coal is still a serious drawback. Under such conditions it became necessary for the woollen industry to assume a specialized form. The quality of the Tweed cloths is extremely fine, and the hosiery of Hawick has a world-wide reputation. The woollen-mills are situated at those market towns where water could be utilized—*e.g.*, at Hawick (17,000 inhabitants), Galashiels (13,000 inhabitants), Selkirk (5600 inhabitants), and Peebles (5800 inhabitants), while Kelso and St Boswells collect the prize rams for export to Australia and New Zealand. Berwick (12,000 inhabitants), the natural port of the Tweed valley, was the medieval outlet of the fleeces and hides exported to Flanders. Until the end of the thirteenth century its hinterland was the richest agricultural area of Scotland, and for a time it was the leading Scottish port. Ruined by English invasions, it was finally lost before Tudor times. It was separated from its natural hinterland by a customs frontier until the Act of Union (1707), with the result that its export trade languished. Till 1603 it was an important frontier fortress. Its harbour is not suitable for modern trade, and practically the whole of the exports of the Tweed basin are carried away by rail. A number of fishing vessels use the port. It is now included in England.

The Pennines

1. **Upland Districts.** The upland mass of South Scotland and North England is broken by three groups of east-west-

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trending faults. The Southern Uplands are separated from the Pennine fold by the Tyne faults. The Stainmoor and Craven faults divide the Pennines into three groups, the North, Central, and Southern Pennines. Overlooking the Vale of Eden, the Northern Pennines end in a steep escarpment, the highest point of which is 2800 feet above sea-level, and fall to the east in a series of smaller step faults. The surface is composed of Carboniferous Limestone capped here and there by Millstone Grit and limestone shales. Coal has been mined in the Plashetts and Scremerston areas (*cf.* Canobie, in the Southern Uplands). The Central Pennine

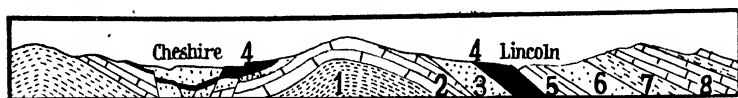


FIG. 88. SECTION FROM NORTH WALES TO LINCOLN

1, Silurian; 2, Carboniferous Limestone; 3, Millstone Grit; 4, coal measures, 5, Magnesian Limestone; 6, Trias; 7, Lias; 8, Oolite.

block and the north-south line of folding is crossed by a transverse axis which can be traced also in the Cumbrian hills and the North Yorkshire moors. The folding of the Pennines has led to the destruction of all rocks younger than the Millstone Grit. Over large areas the grit itself has disappeared, leaving a karst type of scenery in the triangular block of mountain limestone between Kirby Stephen, Clitheroe, and Leyburn. To the east and west of the grass-covered slopes of the Carboniferous Limestone are the heather moors of the Millstone Grit of the Pateley Bridge and Sedbergh districts. Coal has been worked on a small scale, but the power resources of the Central Pennines are too small to support modern textile industries, though there are numerous deserted water-mills—*e.g.*, in Upper Wharfedale, on Burnsall Fell.

Practically the whole of the upland areas of the North and Central Pennines is pastoral, and the people live in the dales, where a little arable farming is possible. The lead-silver mines which produced 27,000 tons of lead annually during the middle of the last century are now abandoned. The only mineral of any value is limestone, which is used

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as a flux in the furnaces of the Tees mouth. The rivers, however, are important as a source of water for the industrial towns of the Southern Pennine coalfields.

The Southern Pennines continue the folds to the south of the Aire gap. They have densely populated valleys, the centres of important industries which owe their origin to the value of the soft-water supplies of the Millstone Grit in the wool-washing, bleaching, and dyeing industries of the textile districts of Lancashire and Yorkshire. It is only in the extreme south that the Carboniferous Limestone reproduces the conditions already noted in the Central and Northern Pennines, with abandoned lead-mines in the picturesque dales of the Peak district.

The larger of the remaining uplands is the dissected hill mass of the Lake District. Here a large igneous dome surrounded by Carboniferous Limestone and Silurian rocks was the centre of intense glaciation, which is reflected in their land-forms.

As in the Pennines, the soils of the Cumbrian uplands are suitable only for pasture, sheep being kept on the upper parts and cattle in the valleys. At various times mineral deposits have been worked profitably—*e.g.*, the graphite-mines of Borrowdale. Cultivation, however, is everywhere limited to the areas where drift or alluvial soils have accumulated, and the line of arable farms ends abruptly at the upper limit of the boulder-clay. It is in the lowlands, however, that the drift soils are most important, and agriculture is determined partly by the surface soils and partly by their drainage.

The smallest upland area in Northern England is the dissected tableland of the North Yorkshire moors. A considerable area of North-east Yorkshire lies above the 800-foot contour, which forms the upward limit of cultivation. Composed of Liassic and Oolitic sandy limestone, it is covered with heather moors, grass-farming being confined to the edges and those valleys which contain alluvial and drift soils. Sheep are the chief product, though attempts are occasionally made to raise oats and rye. The population is scanty, and is confined to the outlets of the valleys and to

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the iron-mining districts of the north-east. There is only one town, Whitby (11,000 inhabitants), formerly a fishing and iron ore port of considerable importance. Whitby was an important ship-owning port long after its foreign trade had ceased—a case of geographical inertia seldom paralleled. At the present time it is the market for the local fishing villages and for the Esk valley. It is a 'short season' summer resort, but though it is the nearest port to the Dogger Bank its remoteness from densely populated areas renders it unsuitable as a modern fishing-port. The rockbound coast offers a meagre livelihood to the coastal fishermen, whose dialect is remarkable for its use of words of Norse origin.

2. The Lowland Districts. The Solway plain and Eden valley, and the lowlands of North Lancashire and the Lancashire-Cheshire plain, lie on the west of the Pennines. To the east lie the Durham plateau, the vales of Mowbray, York, and Pickering, the Wold country, and the plain of Holderness. These contain an area of fertile soil which would probably support an average of 200 to 250 persons per square mile throughout the whole of Northern England. It would be impossible, however, for the farming districts to supply the whole of the food requirements of the industrial districts.

In the Durham-Northumberland plateau the effects of glaciation are visible almost everywhere, and the sides of the Tyne, Wear, and Tees are thickly plastered with boulder-clay, and the incursion of ice from Scotland and Norway has partly covered the Magnesian Limestone of the Durham plateau. In consequence, the varied nature of the subsoil is obscured, and the greater part of the surface is under grass, root crops, and oats. Cattle are the chief product of the farms, and considerable areas are used to provide hay for the pit-ponies. Numerous glacier and moraine lakes were formed during the Ice Age, and a chain of lake plains extends from the Tyne to the south of Yorkshire, giving soils suitable for arable farming wherever drainage works have been made. In some cases, however, the marshes were choked with peat, and there are considerable areas of marshy pastureland in the Solway plain and the Lancashire-Cheshire plain,

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in the Bradbury district of South Durham, in the Vale of Pickering, and in the Ouse and Trent valleys. With the exception of some parts where the Ouse and Trent basins converge on the Humber estuary, none of these areas has been drained sufficiently for complete conversion into ploughland, and large tracts are permanently under grass. Where the natural drainage is good on the margins of the valleys there is a larger percentage of arable land, especially in the north and south of the Vale of Pickering, in the Permian outcrop of the west of the Vale of York, and in the plain of Holderness, where wheat is important. The centre of the Vale of York was formerly important for wheat, but the high cost of preparing the heavy clay soils for grain crops has led to the extension of grass-farming for the fattening of store cattle, the cattle-market of York rivalling in importance that of Carlisle.

In the south of the Vale of York the floodlands reclaimed by the use of Dutch methods of warping form excellent arable soil, which in the past has produced large crops of potatoes, peas, beans, grain, and flax harvested by seasonal labourers from Ireland. At the present time, however, the area of sugar-beet is increasing at the expense of that under potatoes. Throughout the Vale of York is sufficiently dry for the cultivation of wheat, and the reasons for the dominance of pastoral farming are economic.

The only other important areas for wheat are the Wolds, Holderness, and part of the Vale of Pickering. The Wolds were formerly occupied by poor sheep-pastures and rabbit warrens, but they are now one of the best farming districts in England. Their light soils are easy to work, sheep being reared as an essential element in the rotation which enables wheat to be produced. In Holderness the chalk is covered by drift, and the district may be regarded as an outlying fragment of the agricultural region of the Eastern Counties.

To the west of the Pennines, where the climate is damp and mild, the rich red Vale of Eden has nearly one-third of its area under oats, turnips, swedes, and potatoes, and the fattening of stock is again the principal branch of farming.

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Dairy-farming and the production of vegetables are most important near the industrial districts of Yorkshire and Lancashire; even then it is often impossible to obtain an adequate supply of fresh milk in the Durham coalfield, and large quantities of Danish and Irish butter are imported through Grimsby, Hull, and Liverpool. Practically the whole of the bacon, fruit, and wheat supplies are also imported. Meat and milk are the only foodstuffs of which the lowland farms of Northern England produce anything approaching an adequate supply. In the Lancashire plain the rainfall is considerably greater, the winters are milder, and the whole year more cloudy than in the west, except in a small sunny area along the coast near Blackpool. The Lancashire climate is distinctly favourable to the growth of oats, roots, and hay, and where manured the sandy loams are frequently under a potato, oats, and grass rotation. The fine soils of reclaimed peat districts are often under vegetables, especially in the Mersey valley and along the Liverpool and Wirral coasts. Practically the whole of the rest of the Lancashire plain is under permanent grass used in the great meat and dairy industries. The cattle pass to the butchers through the markets of Skipton and Preston. The market-garden produce is chiefly produced near Chester and Liverpool. Many of the dairy cattle are still fed in the towns, fodder being brought in from the arable districts. There is also a great movement of milk and cattle from Cheshire and North Wales. Manchester is the chief market for farm produce, while Liverpool is the great centre for imported foodstuffs and fruit.

Though Northern England produces a large proportion of the meat and milk which it consumes, large shipments of wheat, oil-seeds, and foreign butter are needed to maintain the dense population of the industrial districts. The flour, cattle-cake, and margarine industries have therefore been concentrated in the ports of the chief estuaries, and there are a number of modern flour-mills and cattle-cake and soap factories at inland river-towns such as Dunston-on-Tyne, Chester, Ellesmere Port, Pocklington, and York.¹

¹ After being carried on for many centuries the flour-milling industry of York was discontinued in 1931.

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Carlisle (57,000 inhabitants), the lowest bridge-town and former tidal limit of the Eden, was chosen by the Romans because of its easily defended position on a low hill near the junction of two rivers at the head of a large inlet. It was England's frontier fortress against the Scots long after the other border fortresses had begun to decline. It became the centre of west coast routes between Scotland and England, and was connected by canal with its outpost, Silloth, because of the shallow nature of the mouth of the Eden. The industrial development of Carlisle is typical of other settlements near the limit of tidal navigation. The protection of its castle and the focal position of its bridge made it the centre for inland and overseas trade (*cf.* Chester, Lincoln, and York). Ships arrived at intervals, and were loaded and unloaded in very much the same way as are the ships which arrive at the Hudson Bay ports at the present time. Agriculture and trade were seasonal in character, and there was often a surplus of labour and of raw materials in the warehouses. This gave rise to hand-loom industries requiring skill but very little mechanical power. Thus Carlisle, Kendal, and Lincoln became locally important as wool- and leather-manufacturing centres. When civil wars ceased at the close of the Middle Ages simple water-driven machines were invented, and the textile manufactures migrated to the narrow tributary valleys of the hills, and the junction of the lowest bridge-town became that of a warehouse for cloth and a centre of the clothing industry. Finally, with the opening up of the coalfields few of the medieval ports were able to continue their textile industries except in a more highly specialized form.

In the case of Carlisle the cotton, flannel, and silk industries still exist, and much use is made of artificial silk in the production of high-class expensive goods. Many of its other industries were the product of local raw materials, but the wheat used in the present biscuit industry is made from imported wheat milled at Silloth. The engineering industry of Carlisle was greatly increased during the World War, the Government factories being established outside the effective range of German aircraft. Possessing neither navigable

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river nor seaboard, Carlisle has little inherent advantage as an industrial site except in its railways. Its chief function is as the market for a large agricultural district, and as its products are not subject to elastic demand it is less intensely affected by trade booms and industrial depressions than those centres which possess one industry whose output is subject to fluctuating prices.

Lancaster (43,000 inhabitants), the bridge-town and limit of navigation of the Lune, was an important medieval castle-town because it commanded the coastal and valley routes to the Vale of Eden. Its position at the outlet of the Cumbrian uplands into the North Lancashire plain makes it an important market for cattle and sheep, but its cotton-spinning, furniture, and linoleum industries are relatively unimportant.

York (84,000 inhabitants), the chief city of Roman Britain, grew up at the point where the Ouse broke through the great York moraine, which provided the only practicable dry-land route between the Wolds and the Permian outcrop on the west of the Vale of York. Defended on the east by the marshes of the Foss, York became a great fortress during the century and a half required to conquer the Brigantes, and it has remained the chief military centre of Northern England ever since. As it possessed the lowest bridge across the Ouse, it became the great medieval port and manufacturing centre of Yorkshire. In 1377 there were 800 looms, but with the use of the Pennine water-power its industrial importance declined, and but for its fortuitous development as a railway centre its industrial life might have ceased. The railway connexions re-established York's important cattle-market, and made it the shopping centre for villages in the west and east within a twenty-miles radius. Before 1850 it was the inland river-port for West Indian sugar landed at Hull, and this gave rise to important confectionery industries. Imported grain is also brought upstream, and its steam-mills have replaced the numerous windmills formerly used for grinding locally produced wheat. The Corn Exchange has been converted into a variety theatre.

York's administrative powers have gradually been given

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to the centres of the Ridings—Wakefield, Northallerton, and Beverley; as a commercial centre it has long been replaced by Leeds, and its ecclesiastical dominance has lessened with the creation of bishoprics at Beverley, Hull, Whitby, Ripon, and Sheffield. Its water communications fall short of the modern needs of a river-port, and it is chiefly important at the present day as a confectionery-making, tourist, and railway centre.

3. The Coalfields of Northern England. The Pennine region contains 64,000,000,000 tons of coal, or one-third of the estimated reserves in the British Isles. Coal is found also at a workable depth along more than seventy miles of the coast, a condition favouring iron, ship-building, and coal-export industries on the north-east coast and in Cumberland. The coal produced in North Staffordshire, Lancashire, Derby, Nottinghamshire, and Yorkshire is chiefly used in local industries, but it should be noted that the recent development of the concealed coalfield of South Yorkshire has given to the Humber ports more than one-tenth of the total coal-export trade of Britain. As more than 60 per cent. of the total coal reserves of Northern England lie in the York-Derby and Nottingham field, this proportion is likely to increase, and industrial development in the Ouse-Trent area should be continuous.

The *north-east coast industrial area* stretches from the

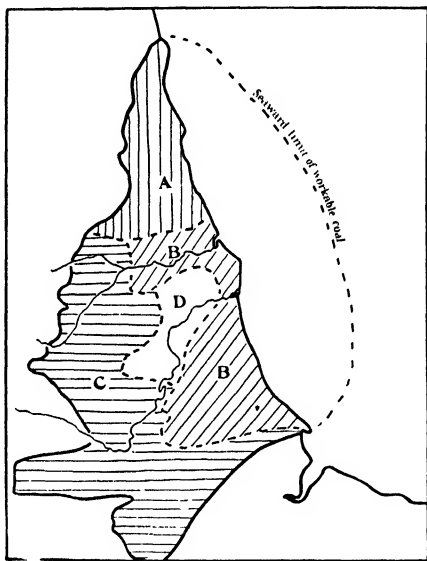


FIG. 89. NORTHUMBERLAND AND DURHAM COAL

A, steam; B, household; C, coking; D, gas.

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river Coquet to the Tees, coal being found not only in the coal measures, but also in the Carboniferous Limestone near Peel Fell and on Holy Island. In general, the seams dip to the south and east and descend in a series of step faults under the Magnesian Limestone of South-east Durham. The thirteenth-century development of the coal-export trade of the Tyne was due to the ease with which coal could be mined in the high land through which the Tyne trench is cut. High banks facilitated the loading of coal by gravity, and as late as the middle of the nineteenth century the hauling of coal to the boats by chains of trucks drawn by fixed engines and horses along railway inclines was cheaper than by means of locomotives. Thus the Tyne was able to maintain its early advantage over the Tees ports, where the expensive system of pack-horses, costing 2s. 6d. per ton-mile, carried on since Roman times, eventually developed into transport by steam railways.

Another advantage possessed by the Tyne is in the greater variety of coal in its neighbourhood. About 27,000,000 to 33,000,000 tons, one-third of Britain's foreign export of coal, is derived from Northumberland and Durham. Normally about 4,000,000 tons are shipped from Blyth and Amble, 16,000,000 tons from the Tyne, 5,000,000 tons from Sunderland, and 3,500,000 tons from Seaham and Hartlepool. For centuries the Tyne dominated the coal-trade of London because of its monopoly of the Tyne coal-staithes, and though that monopoly passed with the construction of railways at least half of the coastwise traffic in coal originated on the north-east coast.

The north-east coast is also unique in its large supplies of coal suitable for blast-furnace coke, and the Tees mouth is the chief centre of pig-iron production in the United Kingdom. Forges existed in Roman times, but the first large-scale development followed the arrival, at Shotley Bridge, during the reign of William III of a colony of German iron-workers. Throughout the eighteenth century the blast-furnaces were localized where water-power was available for working the bellows—*e.g.*, at Chester-le-Street. Though some ore was obtained from the coal measures, the

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principal source of supply was the Yorkshire coast near Robin Hood's Bay, and Whitby became the iron-ore port of the north-east coast. It was impossible, however, for this pig-iron to compete with that of Scotland, where raw material (blackband ironstone), labour, and transport were cheaper than in Northumberland and Durham.

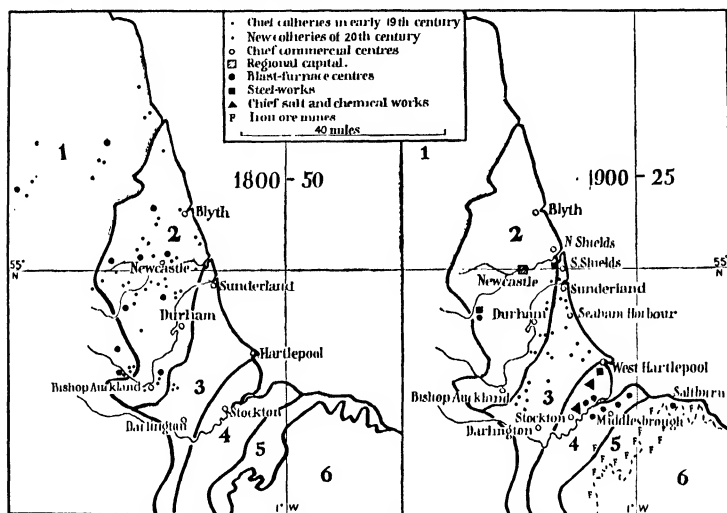


FIG. 90. THE MIGRATION OF THE COAL AND IRON INDUSTRIES OF THE NORTH-EAST COAST

1, rocks older than coal measures; 2, coal measure outcrop; 3, Magnesian Limestone outcrop; 4, Trias; 5, Lias; 6, Oolite.

Long before the discovery of the basic process the opening up of railways carrying coal to London from other coalfields had forced upon the North Country the necessity of cheapening coal transport by sea. About 1850 an iron ship of 650 tons, the *John Bowes*, was launched. In five days the vessel performed successfully an amount of work which would have taken two full-sized wooden colliers upward of a month. The building of wooden ships, an industry for which the Tyne, Wear, and Tees were famous, was abandoned, and the demand for iron and steel increased. The Crimean War led to the development of armoured warships,

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and this gave rise to the steel-plate industry of the Tyne. In 1862 the shipbuilding industry of the north-east coast was consuming nearly 40,000 tons of iron, and the railways and engineering works also made great demands on the iron industry. About 135,000 tons of iron ore were obtained from

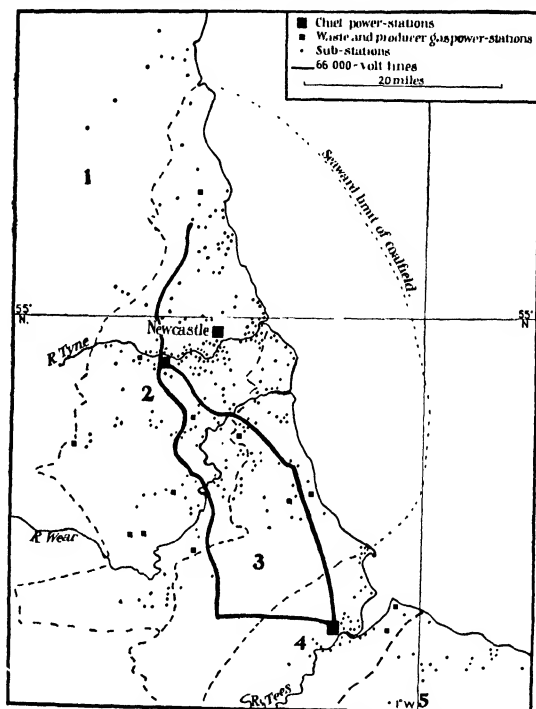


FIG. 91. THE NORTH-EAST COAST AS A POWER UNIT

the hæmatite-mines of Weardale, and 700,000 tons were brought by rail from Cleveland. The annual production of finished iron was about 300,000 tons. The pig-iron output of the north-east coast was only surpassed by the outputs of South Wales and Scotland, but less than 30 per cent. of the furnaces were on the Tees, and one-third were situated inland. Bessemer steel-works were erected at Tudhoe and on the Tyne.

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With the development of the basic process the nearness of the iron-mines of Cleveland, of the Magnesian Limestone of Ferryhill, and the Carboniferous Limestone of Teesdale and the upper Wear, of the coking coal of Bishop Auckland and Spennymoor, and of a deep, navigable estuary led to the concentration of the pig-iron industry on the waste foreshores of the Tees' mouth, and particularly at Middlesbrough (138,000 inhabitants) and Port Clarence. This concentration of the iron industry at the place where geographical conditions were most favourable proved an economic success, and though large quantities of foreign ores—chiefly Swedish and Spanish—are also needed the Tees has remained the chief centre of the British iron industry. The steel industry, which is second only to that of South Wales, has also migrated to the coast, with the single exception of the industry at Consett, where the disadvantage of inland situation is met by favourable railway rates during periods of depression. The Tudhoe Grange works were removed before the War to Cargofleet. The growth of the iron manufacture led to the development of a great coke-oven industry in the south-west of the coalfield, and especially in the Bishop Auckland-Spennymoor-Brancepeth-Ferryhill district, the coke being carried in steel trucks by electric railway from Shildon to Cargofleet. The chief products of the coke-oven industry are benzol, ammonium sulphate, and pitch. Each of these commodities may be marketed profitably, and the waste gases are used for the generation of electric power, the coke-oven power-stations being linked up with the great power distribution net, a pre-War development of which this district was the pioneer in Britain.

Unlike other sub-regions, the north-east coast offers little factory employment to women, as practically all the industries demand male labour. This fact and the interdependence of its industries make it extraordinarily sensitive to trade booms and depressions. The existence of important beds of rock-salt at the Tees' mouth in close proximity to coal and tidal water has given rise to the manufacture of synthetic ammonia and nitrates at Billingham, near Tees' mouth. The salt is also needed in the important fishing

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industry of North Shields and Hartlepool. The latter industries do not depend on the prosperity of the coal-export, iron, steel, and shipbuilding industries, and they are also capable of extension by the development of fish meal and manure industries, in which women may be employed.

Newcastle (283,000 inhabitants), the Norman bridge-head

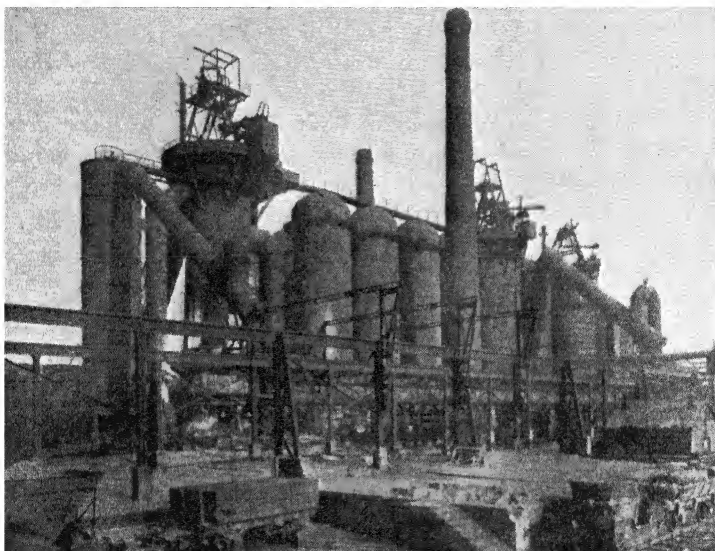


FIG. 92. BLAST-FURNACES, CARGOFLEET

on the Tyne, joins the Team and Derwent valley routes to the only practical road along the Northumbrian coast into Scotland. Its importance as a fortress disappeared during the eighteenth century. Its coal-export and shipbuilding industries rank second to those of Cardiff and Glasgow. It is the chief market for the 2,500,000 people of Northumberland, Durham, and the Vale of Eden.

Sunderland (185,000 inhabitants) is to the Wear what Newcastle is to the Tyne, but the Wear is not navigable, and, except in its relations to local collieries, Sunderland is

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isolated from the general life of Durham and concentrates on shipbuilding.

The Tees' mouth suffers from being divided between two administrative areas, Durham and North Yorkshire, with the result that civic development has been retarded. West Hartlepool (68,000 inhabitants) has a number of trades—*e.g.*, steel, shipbuilding, sailcloth, jam, and fish. The amount of coal it exports almost balances in bulk the volume of the 600,000 tons of timber imported annually. It is the chief storage centre for pitprops in Northern England, but has not developed large timber-using industries. With the exception of the highly specialized port of Middlesbrough there are no large towns on the Tees, and the former ports of Yarm and Stockton have lost their overseas trade. Darlington (72,000 inhabitants) owes its importance to the early development of railways and to the energy and enterprise of its Quaker colonies.

The *north-west coast coalfield* produces less than 2 per cent. of the total British output of coal. This is shipped coastwise and to Ireland. Deposits of high-grade non-phosphoric iron ore are mined in the Cleator, Furness, and Millom districts, both for the furnaces of Workington and Carnforth and for special steels made at Middlesbrough and Sheffield. Iron ore is also imported from Algeria and Spain, together with manganese ore from Takoradi, on the Gold Coast. The industrial expansion of the Cumberland coalfield was the outcome of the export trade in coal to Ireland, and especially to Southern Ireland: This market was shared with Scotland, Lancashire, and South Wales. Numerous faults make mining difficult, and there is often a long journey under the sea to the coal face. There are no natural harbours, and the little ports require constant dredging. Workington (24,000 inhabitants) produces coal, coke, by-products, and steel, while Whitehaven (21,000 inhabitants) exports coal to Ireland and has tanning and flour industries. Coal and iron were formerly mined side by side, but though the beds of hæmatite are by no means exhausted the undeveloped areas lie chiefly in the south—*e.g.*, Furness—away from the coalfields.

Barrow (66,000 inhabitants), the chief industrial town,

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owes its rise to the development of iron shipbuilding, which became possible with the invention of Bessemer steel. The chief iron-mining centre is Dalton-in-Furness, but the coke for the blast-furnaces of Barrow, Millom, and Ulverston has to be brought by rail from Durham. Because of the isolation of the north-west coast it is as cheap to send Cumberland steel to Philadelphia as to Sheffield, and the only important market for the steel is in the local shipyards. Minor industries include the making of paper from imported timber and esparto, but there are few alternative occupations which might relieve unemployment.

The Yorkshire, Derby, and Nottingham Coalfield. The Aire valley forms the northern limit of the great Yorkshire-Nottingham coalfield, which contains nearly a quarter of the coal reserves and produces more than a quarter of the coal output of the British Isles. The Pennines, to the north, have little coal. Throughout the Middle Ages there was only one town of more than 10,000 inhabitants. This was York, second as a staple port to London, and an ecclesiastical and military centre (see page 448). There were also several small castle-towns, in which had grown up markets of purely local importance. In the fourteenth century a large proportion of the inhabitants of York were directly or indirectly dependent on the manufacture and sale of cloth made from the wool of the Pennines. Later the development of simple machinery, worked by water-power, caused the industry to migrate to the valleys of the Pennines, where there was soft water for washing the local fleeces.

(i) *The West Riding Woollen District.* Gradually the villages where the Aire and Calder valleys entered the Vale of York became important linen- and woollen-cloth markets to which the cloth was brought by pack-horses prior to its being loaded into boats which carried cargoes to the little Humber ports for shipment to London or directly to the Continent. By the middle of the sixteenth century all that remained of the woollen industry of York were four looms and a market for cloth produced elsewhere, while Hull tended more and more to monopolize coastal and foreign traffic. The next development was the introduction of steam-power, and this

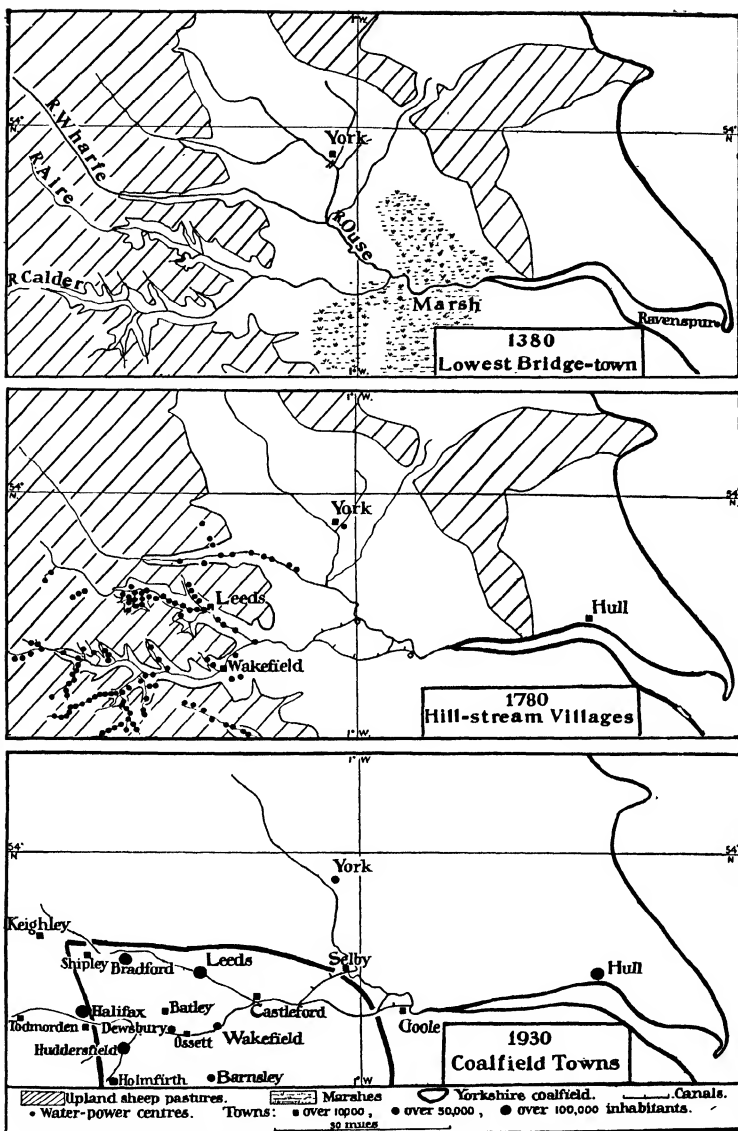


FIG. 93. THE MIGRATION OF THE YORKSHIRE TEXTILE INDUSTRIES

The medieval woollen industry was centred in the lowest bridge-town, York. Between 1500 and 1800 direct water-power was used, and the industry migrated to the upland streams, with markets at Leeds and Wakefield. In 1823 the first power-loom was introduced, and the industry was localized in those centres where there was coal.

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led to the decline of the water-power mills of the upland areas and the concentration of the woollen industry in factories situated at nodal points. At the present day four-fifths of the wool consumed in Britain is manufactured in the valleys of the Aire and Calder, and as each process is highly localized the larger towns have become the centres of closely related groups of fabrics. Bradford (298,000 inhabitants) produces yarn and worsted, Huddersfield (113,000 inhabitants) specializes in worsted, and especially in serges and tweeds, Halifax (98,000 inhabitants) is the centre for heavy woollen goods and carpets, and Dewsbury (54,000 inhabitants) is noted for shoddy. These and other towns form part of a single urbanized area or conurbation which contains more than a million inhabitants. The old Cloth Market, Leeds (482,000 inhabitants), at the junction of road, rail, and canal communications, is the chief centre for the manufacture and sale of ready-made clothing, nearly one-tenth of the population of Leeds consisting of Jews engaged in the clothing industry. Its chief importance is as a market, and there are a number of other industries—*e.g.*, iron and steel, non-ferrous metals, leather, and engineering. For more than a century machinery-makers have associated with cloth-manufacturers, and Leeds shares with Keighley the textile machine industry.

(ii) *The Sheffield Steel District.* The Sheffield area produces between one-tenth and one-eighth of the total steel output of the British Isles, but it should be remembered that this has seldom exceeded 10,000,000 tons, and is generally considerably less. The development of iron manufactures near the Sheaf and adjoining valleys was due to the existence close together of iron ore, timber, and water-power. The special development of the cutlery and steel industries owed much to imported iron in this area, to the existence of grinding and refractory materials, and later to the use of coal.

The early cutlery-works were strung out along five hill-streams converging on what is now the heart of Sheffield (511,000 inhabitants). Rotherham (69,000 inhabitants), a smaller centre of heavy iron and steel goods, lies a little lower down the Don valley. Later the demand for coal and

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easy transport led to the concentration of the heavy industries in the Don valley, to the east of the town. The lighter industries lie generally on somewhat higher ground. The

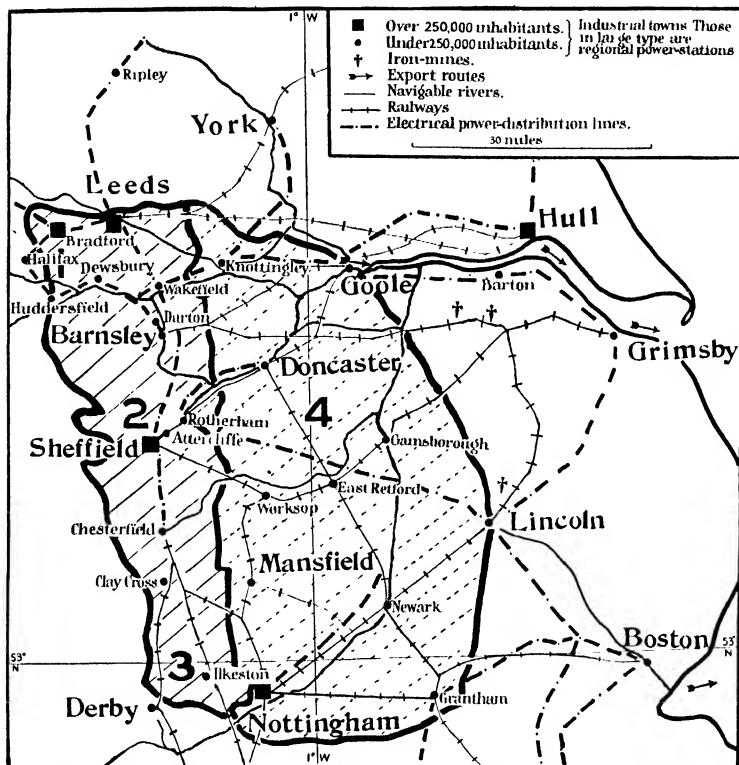


FIG. 94. THE SOUTH YORKSHIRE COALFIELD

1, the West Riding woollen district; 2, the Sheffield steel district; 3, the Nottingham textile district; 4, the concealed coalfield.

Sheffield cutlery industry is an excellent example of geographical inertia, the factors which led to its localization being no longer in operation. Sheffield has attracted railways, but it is not a natural centre of routes, and all roads and railways except by the Don valley are heavily graded. The existence of iron ores at Staveley has given rise to iron

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and engineering industries at Chesterfield (64,000 inhabitants), on the Rother, and canal connexion with the Trent, and at Worksop (26,000 inhabitants), which also shares in the metal and engineering industries of the Don valley.

(iii) *The Nottingham-Derby Industrial Area.* This forms the southern section of the great Yorkshire coalfield, but the great part of the surface rocks are Triassic, the sandstone supplying the soft water for the old textile centres. The relatively unfertile sandstone was formerly covered with woods, which supplied charcoal for the early smiths of Nottingham. Coal-mining is extending eastward under Sherwood Forest, Mansfield (46,000 inhabitants) being the most important mining centre, and Derby (see page 495) the chief railway and engineering centre. Nottingham (see page 495) remained a river-port until the age of railways. As its coalfield was opened out the mills driven by direct water-power were abandoned, and the lace and hosiery industries concentrated in Nottingham, the chief market. Changes of fashion have lessened the demand for lace, but this has been compensated by an increased demand for stockings. Not only is Nottingham the great lace and hosiery centre of Britain, but its district supplies a large proportion of London's domestic coal requirements.

(iv) *The Concealed Coalfield.* To the east of Leeds, Barnsley, Rotherham, and Chesterfield the coal measures dip under the unconformable Magnesian Limestone and the Triassic plain. It is to the east of these towns that the bulk of the coal is now produced in large modern pits. The centre of production of the coal area tends to move east, but Barnsley (71,000 inhabitants) was the chief of the older colliery centres. Its canal communications with the Aire and Calder system and the river Don are still used, but the greater part of the coal produced is carried by a complicated network of railways. During the present century Doncaster (63,000 inhabitants) has become more and more a colliery centre. Doncaster grew where the Roman road from the south swung westward to avoid the swamps which occupied the flood plain of the Don, Ouse, and Trent. With the decline of its coach-road traffic it became a purely agricultural

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market, and it was not until 1875 that a railway was constructed directly across the marshland through Selby to York to form the main line of the east coast to Scotland. It was made the chief rolling-stock centre of the Great Northern Railway, and will probably become a great manufacturing town as the coalfield develops. Between Doncaster and Selby the fenlands and low moors have gradually been drained since the advent of Dutch fen colonists in the seventeenth century. As draining continued a great change took place in the habits of the people, and the wild-fowlers, smugglers, and peat-cutters gradually disappeared or became farmers (*cf.* the Fens with the Dutch polders).

Transport improved, and the Aire and Calder canal system (begun in the seventeenth century) created the canal-port of Goole (20,000 inhabitants), which has been able to increase its export of coal in spite of the competition of railways and the shallow nature of the Humber estuary. If the suggested Doncaster-Humber ship canal be constructed it is possible that the old channel of the Don, closed by the Dutch engineer Vermuyden, will be reopened, and Doncaster converted into a port. Formerly there were several ports on the Humber rivers, and small vessels were able to reach Beverley, Market Weighton, Pocklington, Ripon, on the Ouse, Burton, on the Trent, Castleford, on the Aire, and Tadcaster, on the Wharfe.

The great Humber outports, Ravenser and Ravenser Odd, were situated inside the spur of Spurn Head. It was not until after their destruction by coastal erosion in the fourteenth century that ships began to increase in size and the need for deep-water harbours arose. Hull (313,000 inhabitants) became the great port of the east coast because the mouth of its river offered safe anchorage under the protection of the royal fortress of Kingston. As the river Hull enters on the concave bend of the Humber there is a sufficient depth of water for large ocean-going steamers; the moats of the fortress have long since been converted into docks. Hull is essentially a warehouse port, with a large inland barge traffic, carrying grain and timber in return for coal. In order to keep down railway freights Hull merchants built their

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own railway to Barnsley, but this has been absorbed in the London and North-Eastern Railway. The traditional rights of the barges using the port have helped to keep down the dock charges, and the trade in bulky raw materials—timber, wool, and grain—has constantly increased. Flour and oil-seed industries have developed. On the other hand, Hull's natural advantages as a fishing-port have declined in importance, and the fishing industry is almost an example of geographical inertia. The whaling industry has disappeared, and even the North Sea fishing-grounds are becoming less profitable, so that the fleets are compelled to undertake long voyages, a type of fishing requiring special equipment and considerable capital. Grimsby (92,000 inhabitants), on the opposite bank of the Humber, is the greatest fishing-port in the world, and exchanges South Yorkshire coal for Baltic timber and Danish dairy produce. As in the case of Hull, it owes its rapid development to its railways. Immingham, the great dock immediately to the west of Grimsby, is a recent (1912) railway creation.

The Lancashire Coalfield. This occupies the western slope of the Pennine fold, but is unlike the Yorkshire coalfield, in having the continuity of the coal measures interrupted by the south-west-north-east fold of Rossendale Fells, where the Millstone Grit is exposed. As on the east of the Pennines, the streams of the Millstone Grit were used in early woollen manufactures, but during the eighteenth century the poorly drained soils of Lancashire were unable to support a densely populated local market, and the woollen centres on the west of the Pennines were compelled to specialize in the making of fabrics for distant markets. Other materials besides wool were used, and the term 'Manchester cottons' was used for more than a century before the Industrial Revolution. These cloths, however, were fustians—linen, wool, and cotton.

The Restoration (1660) revolutionized fashions, and clothes were made of lighter and more elegant materials. Linen and silk draperies were introduced, and by 1700 quantities of Indian cotton fabrics were imported by the East India Company. As these became fashionable their import for

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use was prohibited, an exception being made in the case of plain calicoes imported for printing and subsequent re-export. Toward the end of the seventeenth century many Huguenots



FIG. 95. LANCASHIRE-CHESHIRE PLAIN

took refuge in England, and soon there was a flourishing calico industry along the river Wandle. About this time Lancashire began to produce coarse cottons, and profited when the import of Indian cotton cloth was completely

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prohibited. Lancashire's monopoly of the whole market strengthened the position of the cotton-spinners, and technical progress was continuous.

In consequence of the invention of the cotton-gin and of the extension of slave plantations in North America at the beginning of the nineteenth century, cotton became the cheapest textile material. At the same time the cost of mechanical power was reduced, the scattered mills of the hill-streams were abandoned, and the cotton industry was definitely localized on the Lancashire coalfield. The humid climate of Lancashire is often unduly stressed as an important factor, and there are other parts of Britain where the atmosphere is more continuously moist.

In 1800 nearly four-fifths of the world's clothing was made of wool, and only 4 per cent. of cotton, but at the end of the nineteenth century more than three-quarters of the cloth manufactured was of cotton, and only one-fifth of wool. Nearly 5,000,000 tons of cotton are used each year, and as it can be standardized it forms an almost universally acceptable cargo, its fineness, length of fibre, silkiness, and resistance being denoted by numbers (*cf.* coal and grain). Moreover, buyers can be sure of its quality without examination, and the services of an *entrepôt* are not required. It is for this reason that Liverpool and Manchester, though still the most important centres of cotton finance, are no longer the sole European importing markets. Price-fixing is complicated by the variability of cotton output, and the marketing of raw cotton tends to be concentrated in a few important places near the cotton-manufacturing district. It is this that gives to Manchester-Salford (990,000 inhabitants) its peculiar importance as a raw cotton market, though Britain no longer manufactures more than a fifth of the world's output, which is less than half the quantity consumed in the mills of Continental Europe. As cotton is pre-eminently an export industry, the means of communication between the manufacturing districts and the ports have been continuously improved, and the construction of the Ship Canal enables Manchester docks to import raw cotton. Three-quarters of the cotton, however, is handled at Liverpool.

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From a very early date the estuaries of the Mersey and Dee have served the Midland gate which lies between the Pennines and the Welsh uplands. The earliest port was situated at the lowest safe crossing of the Dee, at Chester (41,000 inhabitants). Up to this point the banks consisted of mud and shifting sands, and the sandstone outcrop on which Chester was built was almost surrounded by bogs and marshes, giving it a naturally defensive site. As it was drained the surrounding district was found to be sufficiently fertile to support the Roman legions defending the route to North Wales. The Romans certainly worked the lead-mines of Flint, the copper and iron of Adderley Edge, and the salt of Cheshire.

During the Middle Ages the Dee offered safe anchorage for the largest boats, but as vessels grew larger more and more ships anchored at Liverpool (855,000 inhabitants), where a sheltered creek on the bottle-necked estuary of the Mersey offered safe anchorage, connexion with the mother-port of Chester being maintained by Ellesmere Port and its canal. With the silting up of the Dee and the development of peaceful relations with Wales and Ireland Chester's commercial and military importance declined, its garrison was reduced, and its industries died. The Welsh flannel trade was taken by Shrewsbury, the Irish linen trade by Lancashire, and flour-milling by Ellesmere Port. Chester's chief importance at the present day is as a railway centre, but even so Crewe diverts the whole of the northern traffic on the London Midland and Scottish Railway.

Liverpool, however, continued to grow, and became increasingly important as railways and canals used it as a dock terminus. The growth of rival ports, such as Birkenhead, and the building of the Manchester Ship Canal failed to prevent its continued progress, and in spite of a difficult sandbar it remains the principal British port for American trade, taking 24 per cent. of the total value of imports, chiefly in bulk cargoes, and sending out 37 per cent. of the total exports, chiefly mixed cargoes of manufactured goods derived from all parts of Britain. The Manchester Ship Canal not only offers deep-water communication with the heart of

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industrial Lancashire, but also gives exceptional facilities for the establishment of industries which consume great quantities of imported raw materials, such as grain, timber, and metals.

The salt industry of Cheshire is of ancient origin, but the development of large-scale manufactures is more recent, and is due to salt and coal being within easy reach of the Mersey ports. Northwich (19,000 inhabitants), on the Weaver and the Trent-Mersey Canal, is the headquarters of the Cheshire salt industry (*cf.* Fleetwood, in Lancashire). Throughout the nineteenth century the manufacture of alkalis required both coal and salt, and the chemical industries were localized between the Lancashire coalfield and the Cheshire salt district at points to which the raw materials could be brought cheaply by water or rail. Runcorn, Warrington, Widnes, St Helens, and Liverpool became centres of the soap and alkali industries. At the present time, however, electrolytic methods are used, and it is no longer necessary to bring together the coal and salt. Fleetwood and Northwich have thus become the chief chemical centres, and many of the older works are no longer in operation.

Accrington specializes in alizarin dyes. The production of dyeing, washing, and bleaching materials within a short distance of the textile mills is one of the factors which has maintained Lancashire's leading position in the cotton industry. The Wigan, Leigh, and Warrington iron industries originated with the settlement of smiths in Norman times, and the machinery industry of the present day has preserved continuous contact with the industries using the machines. In fact, the export of textile machinery has been one of the most profitable items in Britain's post-War trade with India and China.

While it is correct to say that spinning is chiefly carried on in South-east Lancashire, and weaving in the Ribble valley, it should be remembered that tradition is extremely important in the localizing of any particular process. Thus, the Amalgamated Cotton-mill Trust owns mills which originated in the eighteenth century hand-loom industry of Wigan, in the spinning and calico-weaving of Bolton, in the high

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quality cambric industry of Blackburn, and in the Sea Island and Egyptian cotton cloth industry of Manchester. The mills frequently specialize in goods for special markets, Blackburn producing cloth for the Indian market, Mossley, Stalybridge, and Chorley high class voiles for the European and American markets. The materials used range from jute and linen yarns to real and artificial silk. Even the spinning-towns specialize, Bolton producing fine yarns from Egyptian cotton and Oldham coarse yarn from American cotton.

In any consideration of the post-War cotton-trade it must be kept in mind that the United States consumes more and more of its own cotton, less than half being exported. As a result, Lancashire has entered on a new period of experiment with new materials, and with cotton from new sources. Lancashire's initial advantage of cheap labour has passed away, but the existence of mechanical industries employing male labour has kept working costs down, and it is only during the present century that the Asiatic mills, equipped with Lancashire machinery and employing very cheap labour, have been able to compete with those of Lancashire. One great advantage remains: the organization and adaptability of Lancashire makes this country the chief source of the finer qualities of cloth, though the market for these is limited by the financially unstable conditions of Continental Europe.

The silk industry was introduced at the end of the seventeenth century by refugee Huguenots, fully half of whom made their way to towns where the woollen industry was languishing. Before the boom began in the cotton industry silk manufactures were already established in Derby, Norwich, Stockport, and London. During the nineteenth century London declined as a silk *entrepôt*, and French designs captured the fancy trade. The quantity of silk consumed in Glossop, Leek, and Macclesfield at the end of the century was negligible, and it was not until after the close of the World War that changes in fashion created a demand sufficiently large to justify the further development of the British silk industry. There are now a large number of factories in the cotton and woollen districts using silk and artificial silk.

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The North Staffordshire Coalfield. Underlying the south-western spurs of the Pennines are quick-burning coals and pottery clays which have been used from very early times for the making of earthenware. During the Middle Ages, being isolated, this poor agricultural region was occupied by small-holders, whose farms did not yield sufficient to maintain them. They were compelled to supplement their income by selling rough earthenware in such markets as Uttoxeter. A traditional skill in pottery-making was thereby established, and at the end of the eighteenth century the construction of the Trent-Mersey Canal allowed China clay to be brought from Cornwall. The Wedgwoods supplied the initiative which made Stoke (276,000 inhabitants), with Burslem, Etruria, Hanley, Longton, and Tunstall, the greatest porcelain and pottery district in the world. Early attempts at glazing made use of local salt and lead, but at the present time the only raw material obtained locally is coal. Pottery is not the only industry, blackband ironstone having given rise to iron and steel manufactures and engineering industries.

IV. WALES AND THE SEVERN VALLEY

The hill country lying to the west of the Dee and the Severn is unlike the other British uplands in that its surface is largely composed of rocks of a slaty nature. Cultivation generally ceases above 800 feet, practically the whole of the upland region being given over to pastoral farming. In consequence, the population of the hill country is scanty, with the exception of those parts of the South Wales coal-field which lie between Loughor and the Usk.

Its relief enabled Wales to maintain its political independence long after the Roman occupation, but the loss of the rich agricultural lands of Shropshire and Hereford prevented its development as a self-supporting economic unit, and until the end of the eighteenth century Wales was unable to support any considerable increase in population. Like other upland districts, Wales was a breeding rather than a feeding ground, and its sons as well as its cattle and sheep had to

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find their food in the richer English plain. With the nineteenth-century development of coalfields, however, certain Welsh districts became centres of immigration, and the *per-*

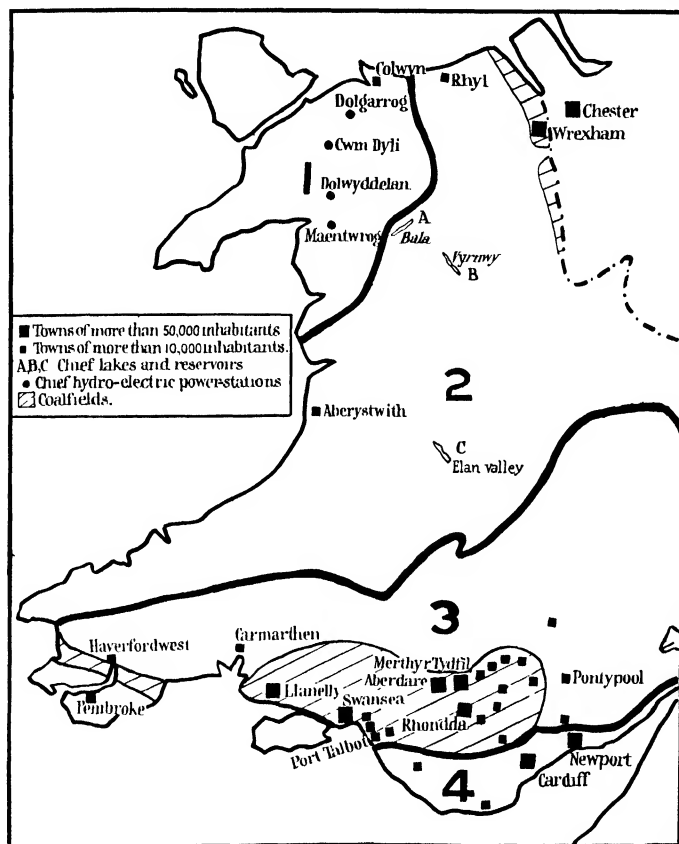


FIG. 96. PHYSICAL SUB-REGIONS OF THE WELSH UPLANDS
1, Snowdonia; 2, central uplands; 3, southern uplands; 4, southern lowlands.

sonnel of the collieries has been recruited from the English lowlands as well as from the poor hill districts of Wales itself. At the present time more than half the population of Wales lives in the county of Glamorgan. In 1911 there were less

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than ten towns of more than 10,000 inhabitants outside the coalfields.

Snowdonia. North of the Bala fault the Carneddys, Glyders, Arenigs, Arans, and Cader Idris form a heavily glaciated mountainous district, of which the principal heights are synclines of Ordovician age. Everywhere, except in the valleys, the soils are too thin for cultivation and there are large tracts of bare rock and heath. In spite of the existence of iron, copper, zinc, and lead the number of people who can make a living has steadily diminished, and there is a constant emigration to the industrial centres of the Lancashire-Cheshire plain. Slates are quarried in the Cambrian rocks at Llanberis, Bethesda, and Nantlle and mined in the Llandeilo (Ordovician) formation at Blaenau Festiniog. The slate is exported from Carnarvon, Bangor, and other small ports along the Menai Strait, chiefly to Ireland, but the Festiniog slate, which possesses a finer grain, and can be split into thinner sheets, is exported to all parts of the world, being carried in coasting vessels from Port Madoc to the great British ports. The English market is supplied by rail from the depot at Mold Junction.

Though the actual splitting of the slates is done by hand the power used in the slate industry of North Wales is derived from the hydro-electric power-stations at Cwm Dyli, Maentwrog, and Dolgarrog, the latter supplying power for the manufacture of aluminium from bauxite imported from South France. The larger power-stations are linked by a 35,000-volt net, but there are a large number of small independent power plants for supplying electric light and power to scattered hamlets and farms.

North Wales is also important for the quarrying of road materials (dolerite and porphyrite), the chief quarries being at Penmaenmawr, which produces macadam. The coastal strip and several of the more picturesque valleys of Snowdonia have a considerable tourist traffic, and Llandudno (14,000 inhabitants) and Colwyn may almost be regarded as summer dormitory towns of Lancashire and Cheshire.

The Central Upland. The central upland possesses less marked relief, and is a highly dissected grass-covered Silurian

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plateau, producing sheep and cattle. Semi-wild ponies are allowed to wander almost without restraint over large areas. Dairy production is becoming increasingly important, especially in the valleys and near Cardigan Bay. The country behind Aberystwyth was formerly important for lead, the inhabitants of the Rheidol and upper Severn valleys combining the occupations of mining and small-scale farming. As the slate scenery is somewhat monotonous, the central upland is not much visited by tourists. Being isolated, the towns of Cardigan Bay are chiefly important as local markets, Aberystwyth (9000 inhabitants) possessing a university college and Cardigan and Llandyssil woollen-mills worked by water-power. In the upper Severn district Newtown (5100 inhabitants) is the chief centre of the manufacture of Welsh flannels. The other woollen centres, Llanidloes, Montgomery, and Welshpool, declined with the introduction of power-looms in Northern England at the beginning of the nineteenth century. The Shropshire hills and the Wells country possess numerous mineral springs, and have more varied scenery; moreover, their valleys have considerable areas under cultivation. The upper Wye supplies Birmingham with water (*cf.* Lake Vyrnwy, in North Wales, which supplies Liverpool).

The Hill Country of South Wales. The Old Red Sandstone escarpment of Brecknock and the hills of South Wales differ from the other Welsh uplands in their lower relief and greater porosity. Consequently there are fewer lakes, and the commercial development of water-power is impossible because of the abundance of coal. The valleys and low-lying districts are more fertile, especially in Pembroke, Carmarthen, and the Vale of Glamorgan. The greater part of South Wales has been glaciated, and the swampy bottoms of the deep U-shaped valleys of the Tawe and the Neath are not cultivated to any extent. Except in the 'valleys' of the colliery districts there is practically no population in the hills. The valleys of the hill districts of South Wales are too narrow to allow of the development of towns round a nucleus, and a series of long, narrow urban districts has grown up, without natural centres of civic life. Wherever the deeply entrenched

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valleys widen a little dense urban populations have taken possession, and uncomfortable overcrowding takes place, and is intensified by the demands of the roads, railways, and canals between which the level ground is shared.

The Welsh Lowlands. Little of Wales can be described as lowland, or even as level land, but wherever lowland occurs farming has been carried on since early times, and in spite of the dominance of sheep and cattle the lighter soils and the drier and sunnier areas produce considerable crops of grain, mainly oats. The chief lowland districts are in Anglesey, Pembroke, and Carmarthen, the valleys of the Teify, the Clwyd, Usk, and upper Severn, the vales of Llangollen and Glamorgan, and the shorelands of the Severn estuary. The Shropshire plain, formerly part of Wales, supplies fattening pasture for the cattle bred in the Welsh hills.

The Coalfields of the Welsh Region

Rocks of Carboniferous age form an almost continuous belt along the north-eastern border of Wales from the Great Orme to Llanymynech, where the Vyrnwy and Severn enter the Shropshire plain. In North Wales the stratigraphic succession is somewhat similar to that of the Southern Pennines, but the coal lying between the Pottery District and Wrexham has been faulted down below workable depths.

The North Wales Coalfield. The North Wales coalfield is highly faulted, the seams are thin and difficult to work, and many of the older pits are waterlogged. The coal seams thin out toward the south, and mining has been abandoned in the Oswestry district. A special feature of the Flint area is the existence of cannel (gas) coal, mined near Mold. As in Yorkshire, the most productive mines are in a concealed coalfield. This lies to the north-east of Wrexham. The gas coals are marketed locally, the steam coals at Birkenhead and Ellesmere Port. Terracotta is produced at Ruabon, where bituminous coal is heated in retorts for the production of phenols used in pharmaceutical chemistry. Iron and steel are manufactured at Brymbo, Hawarden Bridge, Sandycroft, Mostyn, and Shotton, while auxiliary galvanizing works,

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tinplate mills, and shipyards lie between Queensferry and Connah's Quay. The total annual output of coal is about 7,000,000 tons, but the tendency is for the older pits to be abandoned as oil displaces bunker coal.

Coalfields of the Shropshire Border. Little more than one square mile of the Shropshire coalfields lies within the Welsh border, and practically no coal is now mined west of the Severn. Nevertheless, as coal always attracts poorly paid agricultural labour there has been a marked increase in the population of East Shropshire, where mines and industries have absorbed much of the population displaced from the hill regions of South-west Shropshire, Montgomery, and Radnor. At the present time the Coalbrookdale and Forest of Wyre coalfields lie within the economic sphere of the Midlands (see page 490).

The Forest of Dean. This coalfield contains much smaller reserves than that of Shropshire, but the coal is more easily worked, and the coalfield is served by railway and canal. For many centuries the occurrence together of easily worked iron ores, timber for smelting, and navigable water made the Forest of Dean an important centre of iron industries. Tinplate industries are carried on at Lydney and Lydbrook. Some coal is still sent away by river and canal, but the bulk of the output is consumed locally. One of the principal English timber reserves, the Forest of Dean is an important forestry training centre.

The South Wales Coalfield. From Pontypool on the east to St Bride's Bay on the west the main South Wales coalfield occupies a synclinal basin, and the coal measures outcrop all round the edges of the area, except where they are covered by the waters of Swansea and Carmarthen Bays, or, for a short distance near Llantrisant, by newer rocks. Throughout the coalfield is enclosed by older rocks, Carboniferous Limestone and Old Red Sandstone, which outcrop everywhere at the edges of the basin. The coalfield then passes beneath the waters of Carmarthen Bay and reappears in a small outcrop which crosses Pembrokeshire from east to west.

The existence of an east-west anticline passing through

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the centre of the main basin brings the steam coal of the Rhondda area to within workable depths, but there are several parts of Western Glamorgan where productive coal measures lie at depths of more than 4000 feet. The more accessible coal in the east is bituminous, the iron ores of which led to the early development of iron industries in the north-east of the coalfield at Merthyr, Tredegar, Blaenavon, Bryn Mawr, and Dowlais. The Taff basin is the chief source of

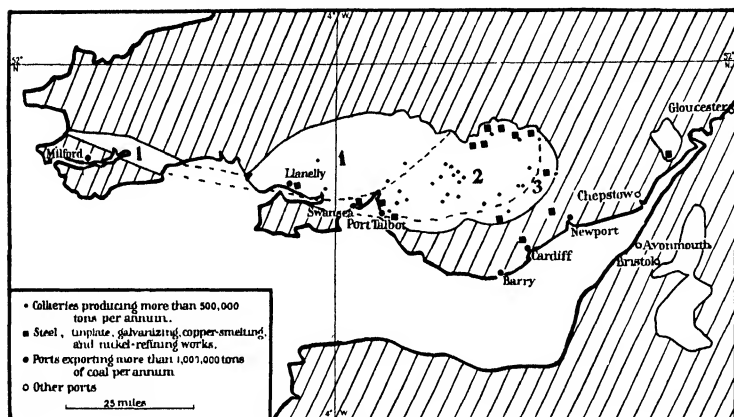


FIG. 97. SOUTH WALES COALFIELD

1, anthracite; 2, steam coal; 3, bituminous and manufacturing coal.

steam coal, while in the west, from Swansea Bay to Milford Haven, the coalfield contains anthracite. It should not be assumed that the eastern part of the coalfield produced nothing but bituminous coal, or that anthracite is the only product of the west, but toward the west there is a progressive change in the type of coal produced even in the same seam.

During the eighteenth century there was no external market for Welsh coal, communications were poor, and the whole of the available labour-supply was absorbed in the iron industry of Merthyr and Dowlais. The only coal mined was used in the iron furnaces, and Cardiff received the greater part of its coal-supply from Milford Haven. The canals and early tramways were built to serve the iron industry, and as

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they were centred on the Usk Newport was the chief coal-exporting centre.

With the construction of railways the London market was thrown open to the collieries of the Midlands and South Wales, and with the opening of the Suez Canal route there came a demand for steam coal which could be supplied only from the mouth of the Taff. Cardiff (233,000 inhabitants), the castle-town at the mouth of the Taff, was a small market of less than 2000 people in 1801. Its position at the mouth of the Taff made it the centre of the Glamorgan Canal-Taff Vale railway system, and after 1850 the Great Western Railway brought it into contact with the London market. Cheap land was required for docks, and the development of steamship routes opened up markets for steam coal in every part of the world. It is still the greatest coal-port, but the development of oil-burning steamers has destroyed its monopoly of the great routes. Moreover, the cost of production is greater, and little use can be made of mechanical cutters. Fortunately the quality of South Wales coal is such as to command a higher price than other European coal, and the United States coalfields are too far from the sea to compete in European markets, so that a large proportion of the steam coal used in the North Atlantic and Mediterranean Sea is still obtained from Cardiff. In 1913 out of a total Welsh production of 57,000,000 tons of coal more than 40,000,000 tons of coal, coke, and patent fuel were exported to foreign countries, and of this 46 per cent. was dispatched from Cardiff. Besides being the largest town in Wales Cardiff is the only place suitable for the development of large-scale industry and *entrepôt* trade. Flour-milling, ship-repairing, and the import of timber are important, and the chief steel-works, which originated in the Merthyr Tydfil district, have migrated to the neighbourhood of Cardiff, where imported iron ore can be more easily obtained. Cardiff is also second to Swansea in the tinplate and patent-fuel industries.

The western valleys—the Neath, Tawe, and Loughor—produce large quantities of anthracite, 70 per cent. of which is exported to France and other European countries. Swansea (157,000 inhabitants), whose Norman castle commanded the

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place where the Tawe valley crossed the coastal road to the west, was the largest market centre in Wales during the Middle Ages. The drift of sand from the west blocked all the rivers of Swansea Bay, and the dunes buried the ancient port of Kinvig. During the sixteenth century the existence of cheap fuel (timber) on this coast induced Cornish copper-smelters to establish copper-works at Neath, and when the German workmen discovered that coal was superior to timber in smelting the copper industry became definitely localized on Swansea Bay, at Neath, Briton Ferry, and Landore. From the sixteenth century onward the existence of coal at tidal water, the relatively plentiful local labour-supply supplemented at times by convicts, and the ease with which supplies of ore can be obtained from overseas, have made the Swansea district the centre of other metallurgical industries, notably zinc, tinplate, and nickel. Tinplate manufacture originated at Pontypool, and must be regarded as a branch of the iron industry. As the iron industry migrated to the coast Swansea obtained a share of the tinplate industry. The invention of a new type of mild steel, which could be rolled, made Swansea the principal centre of tinplate manufacture in Europe.

It is largely due to the technical efficiency of alien immigrants that subsequent developments in the steel and nickel industries were able to take place. For a time Swansea was the chief non-ferrous metal exchange, but as economies have been effected by the creation of selling organizations which regulate the price of tinplates, the present tendency is for London to become the chief metal market of Britain. Nothing, however, can affect Swansea's chief advantage of coal at tidal water, and a large coal-export trade and a patent-fuel industry have grown up. Llandarcy, to the east of the port, is the chief oil-refinery in Europe, and Swansea will probably become the greatest oil-bunkering port of the Bristol Channel. Neath and Llanelly share in the coal-export, copper, and tinplate industries of Swansea, while Port Talbot produces iron and steel and galvanized sheets.

Milford Haven (10,000 inhabitants), Pembroke (12,000 inhabitants), and Haverfordwest (6000 inhabitants) lie on the

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finest natural harbour in Wales, but their development has been delayed by the absence of a local hinterland. Pembroke has been a naval dockyard since the middle of the eighteenth century. Haverfordwest is the centre of coal-mining, and Milford Haven is an important fishing-port, with an increasing coal-export trade. Swansea and Cardiff also possess fishing fleets, which supply the densely populated colliery districts.

A hundred years ago the upland districts of Glamorgan possessed a few moorland sheep-farms, but at the present day nearly a quarter of a million men live in the narrow valleys of the Rhondda and Taff. There is no densely populated part of the United Kingdom where the surface is so broken up by deep and narrow valleys; no part which stands in greater need of having its building development scientifically studied and properly planned. In the Rhondda valleys the bulk of the people live in sunless houses and in dark back rooms from which the only view is of heaps of waste material from the pits. The social welfare of the people of the South Wales coalfield demands a redistribution of the population, even if economic considerations lead to the closing down of old pits and the transfer of miners to other occupations elsewhere. It is suggested that new roads should be made and dormitory towns created outside the present areas of mining. If a larger proportion of the population can be induced to live nearer the coast it is possible that a number of new coal-consuming industries may be brought into existence, and the economic development of South Wales modified by the establishment of manufactures of a general character. It is even possible that more industries may be attracted from the Midlands. Already certain cable and iron industries have been moved to the neighbourhood of Newport (89,000 inhabitants), and the development of tidal power would inevitably make the upper part of the Severn estuary a region of intensive industrial development.

The Severn and Dee Valleys

The Welsh uplands are cut off from the English plain by the waters of the Dee and Severn, except where the land

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lies above flood-level for a few hundred yards in the neighbourhood of Oswestry. These rivers rise in the upland of Central Wales and flow through the Midland plains, where they receive tributaries both from the east and from the west. Their valleys form a frontier zone between England and Wales from Cheshire to Somerset.

1. The *upper Severn and Dee headstreams* have cut deep valleys in the Welsh uplands, and many of the tributaries were formerly used to provide mechanical power for the manufacture of woollen cloth. Few of the old water-mills remain, and the only important centre of woollen manufacture at the present day is Newtown, where coal is used to supply power to the mills. For centuries Welsh cloth was brought down from the limit of navigation on the Severn near Welshpool to Shrewsbury and Bristol for delivery in London. The textile industries of the Welsh border have decayed because of the competition of Lancashire and Yorkshire. Oswestry, which commands the narrow divide between the Dee and the Severn, was formerly important for woollens and cottons, but though it was the headquarters of the Cambrian railway's trade in cattle and timber its population has hardly increased during the past century.

2. The *Shropshire plain* is entered at Llanymynech and the plain of the Dee at Ruabon. The preglacial Severn flowed northward to the Irish Sea, receiving the preglacial Dee as a tributary, but during the Ice Age a large moraine was formed, which separated the Severn from the Dee and Weaver valleys, an overflow channel across the Staffordshire-Shropshire plateau developed, and the Severn waters were transferred to the Avon valley. As a result the fall of the Severn toward the sea is extremely gentle, and throughout Shropshire the river meanders through marshy meadows which provide fattening summer pasture for the cattle brought down from the Welsh hills. For many centuries the Shropshire plain formed the richest part of the Welsh kingdom of Powis, and the river-girt hill at Shrewsbury was the last refuge of the Romanized British refugees from Uriconium (Wroxeter). At a later date the swamps were drained by monks, and it was possible to build roads

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across the plain to the Welsh hills. Being easy to defend, Shrewsbury was chosen as the headquarters of the English troops who conquered North and Central Wales, and as no other place within fifteen miles was allowed to construct a bridge across the Severn all land traffic between Central Wales and England was forced to enter the town, which became the chief medieval export market of Wales. Leather and woollen cloth were collected here, and cloth-finishing industries were not extinguished until new roads were made, which enabled the London woollen merchants to buy cloth within the Welsh border. Early in the nineteenth century Shrewsbury had become an important road centre, with industries—*e.g.*, iron—based on the small local coalfield. Shrewsbury's subsequent growth was due to the town's becoming a railway centre, and it is probably the most convenient meeting-place for the Welsh people at the present time.

3. The *Severn gorge* extends from Bridgnorth almost as far as Worcester. Along its sides lies the Severn coalfield, now almost exhausted, except in the Oakengates-Wellington district. It was in this coalfield that coke was first used on a large scale for the smelting of iron, and hardware and tinplate are still made in the neighbourhood of Broseley and Bewdley. Navigation begins near Stourport, the outlet of the canals of the Black Country.

4. The *lower Severn valley* receives the waters of the Avon, Rea, Teme, and Wye, and forms a distinct basin, the Triassic soils extending from the Malvern district to the Cotswold-Edgehill ridges. Fertile and formerly well wooded, the district round Worcester produces fruits and grain, which support local bacon and sauce industries, while the river is navigable for large barges carrying salt and iron downstream and grain and timber upstream. At Warwick a spur of sandstone became the site of an important castle, which commanded the river-crossing above the marshy region of the Keuper marls. At Worcester (50,000 inhabitants) a hard sandstone ford formed a suitable crossing between the Cotswolds and the Malverns, and was chosen as the site of a Roman settlement. The natural fertility of the locality

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and the development of communications with Wales led to the development of brass, sauce, porcelain, and glove industries.

The Teme and Wye rise in the hills of Central Wales and South Shropshire, where the poor pastures support herds of sheep and half-wild mountain ponies. The Elan valley reservoirs supply Birmingham with water (*cf.* the Vyrnwy and Alwen reservoirs, which supply Liverpool and Birkenhead). The Vale of Hereford is fertile and well watered, with woods and orchards on the valley slopes, fields of grain and hops on the deeper soils, and meadows nearer the rivers. Hereford (24,000 inhabitants) is a river-girt hill market town commanding the important route from Worcester to Monmouth and the Usk valley. Monmouth (4700 inhabitants), where the Monnow joins the Wye, was formerly a border fortress, with woollen, and later tinsplate, industries, now extinct because of the absence of local coal.

The Malvern Hills are an isolated upland of very ancient rocks probably of Caledonian folding. Symonds Yat, commanding the gap through the hills, is a health resort. Farther south the low plateau of the Forest of Dean forms the western boundary of the Severn valley. For many centuries the Forest of Dean was the source of iron ores used in the metal manufactures of the lower Severn, and its coal-supplies are not yet exhausted, being used in the tinsplate industries of Lydney. The chief point of interest, however, lies in the timber of the forest, which is the chief centre of scientific forestry in England. To the east the Cotswold Hills separate the Severn and Thames basins. Gloucester (53,000 inhabitants), the limit of navigation for vessels of 1000 tons, is situated where high land approaches the Severn at both sides. Here the river divides into channels, which facilitates bridging. This induced the Romans to establish a fortress at this point during the conquest of South Wales. Though it was superseded as the principal Roman station by Caerleon, Gloucester became an important medieval market for the corn and wool of the Cotswolds, the iron of the Forest of Dean, and the cattle of the marshy pastures of the Severn and Wye. With the increasing size of ocean-

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going ships its overseas trade declined, but it has an outport at Sharpness, the outlet of the Berkeley Canal, which can be reached by vessels of 9000 tons. If the Birmingham ship-canal system is created Gloucester may again become an important port, but it should be noted that the largest barge which can be used for navigation to Birmingham is less than 100 tons.

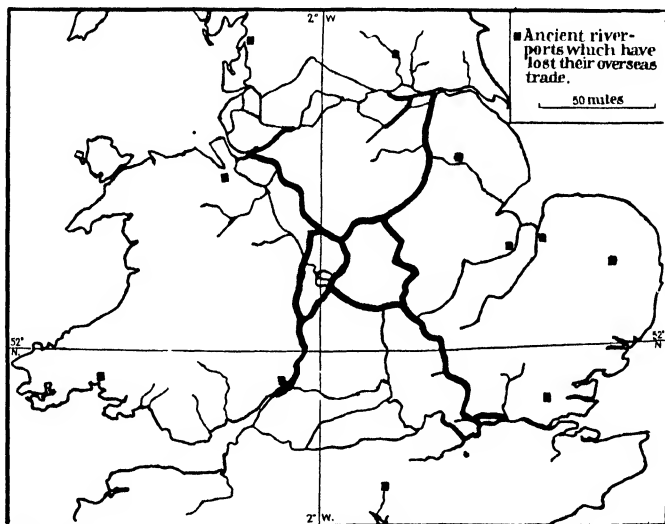


FIG. 98. INLAND WATERWAYS OF ENGLAND AND WALES

The thick lines indicate the projected cross-canal system centring on Birmingham. The cost of reconditioning the 'cross' would be £26,000,000 to carry 100-ton barges throughout; 300-ton barges would be able to reach Leicester, and 750-ton barges Nottingham, but elsewhere the largest boats accommodated would be of 100 tons. The thin lines show the other navigable waterways, but most of these are disused, and the canals carry less than one-twentieth of the goods carried by rail (*cf.* Germany, one-fifth).

The plain of Gloucester and its continuation in the plain of Gwent, along the South Wales coast, consist of New Red Sandstone and Liassic clays, which weather into fertile soils, yielding heavy crops. Moreover, throughout the coastal districts of South Wales and in the lower Severn valley spring heat comes earlier than in any other part of Britain, a condition which favours dairy production in the river valleys and market-gardening on the lighter loams. These condi-

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tions are shared by the plain of Somerset, which forms the junction between the South-western Peninsula and the scarplands of the English plain. (See page 486.)

V. THE SOUTH-WESTERN PENINSULA

The south-western counties of England consist almost entirely of Primary and igneous rocks. The granite heights of Cornwall and Dartmoor form the core of the peninsula. Associated with the granites are deposits of China clay and ores of copper, tin, silver, lead, manganese, tungsten, and arsenic. Unfortunately there is no local source of mechanical power, and the industries are dependent on Welsh coal. Attempts are being made, however, to develop the lignite beds of Bovey. If these are successful the Newton Abbot area will undergo considerable changes, though it is improbable that the whole region will be revolutionized. In common with the peoples of the other upland areas, the Brythons of the south-west fought bravely to maintain their independence, and though the kingdom of Dumnonia was finally crushed by the invaders in the tenth century Saxon colonization was limited to Devon. For several centuries peaceful intercourse was maintained with Brittany, and Breton surnames and place-names are still to be found in that part of the country.

In the north-west of Cornwall Ordovician and Devonian rocks form bare uplands, with heavily wooded valleys, and though the climate of the greater part of the peninsula is mild and damp in most months of the year the air of the north-west coast is bracing, the coastal villages being popular health resorts. The southern coast has calmer and sunnier weather, and palms flourish in sheltered places—*e.g.*, Torquay and Falmouth. In South Devon the Devonian soils are fertile, the valleys wooded, and the climate equable—a country of rich fruit and dairy farms. To the centre of Devon is a Carboniferous plateau which provides poor pasture. In the north Devonian rocks reappear in Exmoor, where deep valleys lying between the upland heaths possess red loams, suitable for crops of roots and clover. It is only

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in the east, however, that there is any large expanse of arable soils, and an irregular belt of Permian and Liassic soils gives great fertility to the broad, well-timbered valleys which lie between Bridgwater Bay and Tor Bay. Wherever these soils lie in the rain-shadow of the uplands conditions

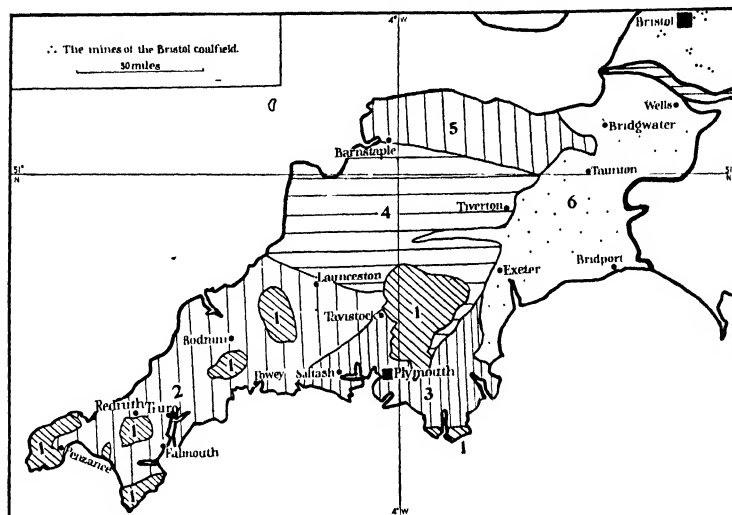


FIG. 99. THE SOUTH-WESTERN PENINSULA

1, Archæan and granite uplands; 2, Cornish plateau (Devonian); 3, valleys of South Devon (Devonian); 4, central plateau of Devon (Carboniferous); 5, North Devon upland, including Exmoor (Devonian); 6, valleys of Somerset and East Devon (Permian, Triassic, and Liassic).

On the north-east the region is bounded by the Mendip Hills (Carboniferous Limestone). It should be noted that as the mines of the Bristol coalfield were not on navigable water the coal used for smelting the iron, copper, and tin was obtained at the ports of South Wales.

are sufficiently dry and sunny for the growth of such cereals as wheat and barley.

The humidity of the climate and the absence of limestone over large areas tend to restrict farming operations to the production of cattle, fruit, and vegetables. Enclosures took place at an earlier date in the west than in the east, so that a system of sheltered small-holdings of rich soil manured with seaweed and sand, producing early flowers, fruit, and vegetables, combined with moorland grazing of store cattle,

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is characteristic of Cornwall and West Devon; while in the east, and especially in West Somerset, where the labour-supply is smaller, the farms are larger, with considerable areas under root crops used for the feeding of dairy cattle. In pastoral districts, and in places where the arable area is limited, secondary occupations, such as fishing and manufacturing, come into existence. The absence of coal has led to the decline of the hand-loom industries, which were carried on before the advent of railways.

Fishing is carried on from small villages, while Brixham, Newlyn, and Plymouth have fleets which land heavy catches of herring, mackerel, sole, whiting, and pilchard. The latter fish visits the Cornish coasts in the autumn, and is taken by seine-nets when close to the shore. The fish are not visible to the men in the boats, whose course is directed by signallers, or "huers," on the cliffs. The bulk of the catch is stored in pilchard cellars, and the fish are salted and packed for export to the Mediterranean ports, where pilchards are known as *fumados*, the popular notion being that they are cured by smoking. A corruption of this word gives us the Cornish "fair maids." The former importance of this trade gave rise to the famous toast of the Methodist fishermen, "Long life to the Pope, and death to thousands." Distance from densely populated districts, the absence of large-scale methods, and the partial disappearance of the pilchards tend to restrict the fishing industry, and many of the younger men spend part of their lives in the Navy. As late as the nineteenth century smuggling was carried on in many of the fishing villages, but the abolition of protective duties has made this industry no longer profitable.

For thousands of years tin- and copper-mining were the chief occupations of the Cornish peninsula, but except in the case of China clay the mines can no longer compete with those of other parts of the world. Tin and copper are still mined on a small scale near Redruth, where deep workings are kept dry by expensive pumping operations, and wolfram is extracted by powerful electromagnets. China clay, formed by the disintegration of granitic feldspars, found its early market in the porcelain industry of Stafford, but in more

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recent years it has been used in increasing quantities for giving weight and finish to paper and calico, and the annual output has risen from 80,000 tons in 1855 to nearly a million tons at the present day. Most of the China clay is obtained from the St Austell district, and exported in small schooners from Fowey to Liverpool, for use in the Potteries, or in large vessels direct to the United States, which take about half of the total export of 660,000 tons. The Dartmoor clay is shipped from Plymouth. Near the coast there are also large quarries of igneous rocks, limestone, and slate, which supply more than a million tons of building and road materials each year.

The south-west is a region of drowned valleys, the rivers penetrating far inland and offering many safe harbours. Abundant timber gave rise to shipbuilding, and the little ports became important when the New World was discovered. The increase in the size of vessels destroyed the maritime supremacy of the western harbours. Its sheltered position and abundant anchorage room enabled Falmouth (13,000 inhabitants) to maintain packet services with the Mediterranean and the American ports, and from 1688 to the beginning of the nineteenth century it was the chief mail-packet station of Britain. Steam changed all this. One by one the great mail-routes were taken to the ports which were connected by rail with London, and when eventually the railway reached Falmouth the headquarters of all the great steamship lines were either at Liverpool or Southampton. This factor of remoteness limits the sea-shipping of the peninsula to the coasting trade. Penzance (11,000 inhabitants), an old stannary and fishing town, is the railway port for the early vegetables and spring flowers of the Scilly islands. In fact, the development of the islands is almost entirely due to the existence of fast railway services with London. Plymouth (208,000 inhabitants) owed its rise to the discovery of America. This made the town a market for overseas trade and necessitated the creation of a naval fortress to command the entrance of the English Channel. Plymouth is a great port of call for mail and passenger vessels to and from America, Africa, and Australia.

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The Bristol District

Triassic soils are found to the west of the Jurassic and chalk country between the mouth of the Bristol Avon and Lyme Regis Bay. This area forms an intermediate zone between the South-western Peninsula and the English plain. Its most important districts are the plain of Somerset and the Bristol district. The plain of Somerset, drained by the Parret and Brue rivers, which converge on Bridgwater Bay, is a varied agricultural district. The alluvium is chiefly under cattle, but to the east the base of the Jurassic slopes is under wheat and oats. In the west, near Taunton, orchards are numerous, and on the cretaceous soil of the south-east sugar-beet is cultivated for the refinery at Yeovil. Throughout the limestone districts of the western extremity of the English plain wool has always been important, and the presence of teazles, water-power, and deposits of fullers' earth gave rise to the important West Country woollen industry of the sixteenth, seventeenth, and eighteenth centuries. Though hampered by the absence of cheap power resources branches of the industry are still carried on at Stroud, Bradford-on-Avon, and Frome. Sailcloth is still made at Crewkerne, and lace at Chard.

The Bristol Avon affords an easy route from the Bristol Channel through the Oolite ridge to the upper Thames, either directly or by the vales of Pewsey and Kennet. From early times this has been an important route for trade with Southern Ireland and the west coasts of England. Bristol (397,000 inhabitants), at the junction of the Frome and Avon, occupied a site which could easily be defended against pirates, and as the Avon gave easy access to the Thames valley Bristol became the second port of medieval England and the headquarters of English trade with Ireland, Wales, Spain, Southern France, and the Mediterranean. To these countries it exported wool, lead, and dried fish in return for wine, oil, and slaves. The voyages of the Cabots, Elliot, and Ashurst made Bristol the first English *entrepôt* for American trade, and the highway between Bristol and London became the chief road in the kingdom. The triangular trade between

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Bristol, West Africa, and the West Indies was extremely profitable, and sugar, tobacco, rum, and cotton industries came into existence. Early in the nineteenth century, however, Bristol's trade in bulk cargoes declined because of the silting up of the docks and the inefficiency of the Corporation, who charged heavy dock dues during the critical period when the introduction of power machinery was revolutionizing raw cotton and cotton cloth production, and thereby restricting the market for West Country woollens. The opening of the Berkeley Canal diverted traffic to Gloucester and the Severn valley, and as the calamine deposits of the Mendips were exhausted the brass industry was attracted to Worcester and Birmingham. In 1834 the shipping of the principal English ports was as follows: Liverpool 1,683,000 tons, London 930,000 tons, Gloucester 346,000 tons, Bristol 290,000 tons, and Hull 204,000 tons. The ports of South Wales, where there were no special town dues, were also rapidly advancing. The passing of the Municipal Reform Act came too late for Bristol to recover the ground lost to Liverpool. The abolition of slavery hampered the West Indian sugar-trade, and Bristol's monopoly of trade with Ireland, Southern France, and Spain was at an end.

Bristol's modern growth followed the creation of a specialized outpost at Avonmouth and the provision of excellent railway-distributing facilities. These have attracted a large import trade in grain, dairy produce, petroleum, and bananas, and, as in the case of Nantes, the old West Indian trade has left behind chocolate, tobacco, and sugar industries, power being derived from the local coalfield, which produces 2,500,000 tons annually. The fact that Bristol is only seventy-five miles from Birmingham should attract trade from the Midlands, but it should be noted that the docks of South Wales are now the property of the Great Western Railway, while those of Bristol are owned by the city. The future prosperity of the port, therefore, partly depends on the policy of the railway companies, or alternatively on the development of the Severn power scheme and the consequent improvement of communications with South Wales.

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Though intended to apply only to the South-western Peninsula, the following quotation summarizes the characteristics of the upland regions of Britain:

The geography of the South-west at the moment affords a remarkable example of the alteration in values of natural advantages with varying circumstances. The old provincial aloofness breaks down grudgingly before the advance of intercourse, and behind the easy-going toleration of the new order there broods in a Celtic twilight that ancient spirit which from time to time bursts forth in a resurgence of national consciousness, such as that which found expression in the fervour of the Methodist movement in the South-west. Language and literature gone, only the tradition remains, a tradition that inspires a population of whom three-quarters are of families rooted here for centuries, and that acts as a constant stream of energy and spiritual enrichment to this and other countries through those who, like so many of their ancestors, seek wider fields for self-expression.¹

VI. THE ENGLISH PLAIN

The south-east of England is built of Secondary and Tertiary rocks, the limestone and chalk outcrops of which stand out as escarpments separated by low clay vales. The alternation of arable and pastoral country makes South-east Britain a peculiarly suitable region for the development of a settled agricultural life, and for many centuries it attracted immigrants from Continental Europe, as well as from the upland districts of Britain. Even at the beginning of the twentieth century the harvests could not be gathered without the assistance of seasonal labour from Ireland. The chief subdivisions of the English plain are (i) the Midland or Triassic plains, which extend northward into Lancashire and the Vale of York and southward into Somerset, (ii) the scarplands, which extend from the neighbourhood of Whitby and Flamborough into the centre of England, and reach the south coast between Swanage and Dover, and (iii) the coastal lowlands of Tertiary and Quaternary age, which extend from

¹ *Great Britain: Essays in Regional Geography*, edited by A. Ogilvie, Chapter V, p. 108 (Cambridge Press).

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the plain of Holderness along the east coast as far as Kent and reappear in the marshes of Romney and Pevensey and in the Hampshire basin on the south coast. The lowland districts are separated by belts of under-populated pastoral country, but are knit together by the economic dominance of London. In fact, the whole plain is sometimes known as "Metropolitan England" because of its intimate relations with London.

1. The Midland Plains

The physical structure and economic life of the Midland plains are intermediate in character between those of the uplands of the north-west and the purely farming country of the south-east. Two subdivisions may be noted—the Primary plateaux and the Triassic plains.

The **Primary** plateaux of Staffordshire, Leicestershire, and Warwickshire (a) consist of small areas of old rocks appearing through the Triassic sandstone. Their coalfields have attracted industrial populations whose demand for meat and milk has stimulated agriculture on the Triassic soils which occupy the basins of the Dee, Severn, and Trent.

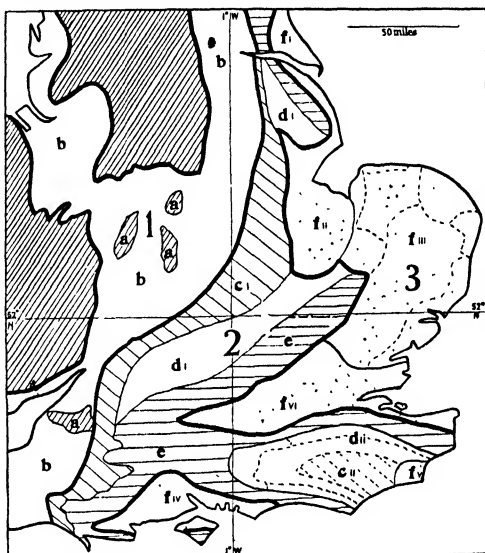


FIG. 100. PHYSICAL SUB-REGIONS OF THE ENGLISH PLAIN

- 1, the Midlands: *a*, Primary plateaux; *b*, Triassic plain.
- 2, the Secondary scarplands: *c*i, the Jurassic uplands; *c*ii, the Forest Ridge; *d*i, the clay vales; *d*ii, the vales of Kent and Sussex; *c*iii-*d*ii, the Weald; *e*, the chalk country.
- 3, the Tertiary and Quaternary lowlands: *f*i, the plain of Holderness; *f*ii, the Fens; *f*iii, East Anglia; *f*iv, the Hampshire basin; *f*v, Romney Marsh; *f*vi, the London basin.

Dotted lines indicate minor subdivisions.

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The *South Staffordshire plateau* is built of sandstone, and has small basins of coal. It stretches from near Alcester, in the south, to beyond Cannock Chase, a distance of fifty miles. The Oldbury-Cannock Chase district in the north is relatively low, but the Dudley-Northfield area is much higher, more than a quarter of the surface lying above 600 feet. The Clent and Lickey Hills give a much more varied scenery, and render inter-communication between the Severn valley and Birmingham difficult. The steeper slopes and heavier rainfall give the streams entering the Severn greater power than those of the east. The blackband ironstone of the coal measures, in the smelting of which the forests were once used, is practically exhausted, but smelting is still carried on during good years at Wolverhampton, Walsall, West Bromwich, Dudley, Wednesbury, and Bilston. Owing to the considerable distance from tidal water, most of the towns have specialized in the manufacture of articles of high value in relation to the quantity of material required for their construction. Traditional skill has played a large part in the localization of the manufacture of jewellery, brassware, nuts and screws, motor-car and electrical fittings. On the north-west is the nearly exhausted Coalbrookdale coalfield, with Wellington as the chief centre of the hardware industry and Oakengates of mining.

The Dudley coalfield formerly produced more than 10,000,000 tons of coal and 1,000,000 tons of iron, and it was responsible for great industrial development in the nineteenth century. Coal-measure clays are still worked near Stourbridge, Dudley, and West Bromwich, but iron is no longer mined, and the coal output of the southern district is less than 2,000,000 tons. The greatest coal reserves lie in the Cannock Chase district, round Rugeley. This northern area produces more than 6,000,000 tons of coal per annum.

Industrial development was slow, but specialization began in the seventeenth and eighteenth centuries, when smith's work was done in the east, and when the rolling of imported bar iron was done in the Stour and Severn valleys. The great advantages of the Severn valley area were the early development of smelting with coke, its superior water-power,

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and the ease of communications along the river Severn, which made Bewdley the great marketing centre of the iron industry.

Birmingham (1,002,000 inhabitants), originally a little village on the river Rea, is situated at the junction of the Bunter Sandstone and the Keuper marls and clays. The former was once covered with oak forests, and had an abundant water-supply. The latter are good ploughland, and contained large areas of marshy pasture-land. This combination attracted leather, woollen, and linen-yarn and butchering industries to the little market town (*cf.* Walsall, Wolverhampton, Stafford, Lichfield, and Worcester). Local smiths in each of these centres were engaged in the making of bridles and stirrups (*cf.* Ripon, in Yorkshire), but the output was limited to local needs, and it was not until the sixteenth century that Birmingham began to develop the making of iron, using local timber, ore, water-power, and moulding-sands. Birmingham remained a small village until after the close of the Middle Ages, and did not become a corporate town. This gave it a freedom from labour restrictions which hampered the neighbouring city of Coventry. As there were no craft companies to put obstacles in the way of influx of labour and the adoption of new processes, Birmingham offered a refuge to Puritans, Nonconformists, and others who could not live in security and comfort in the older ecclesiastical centres of Lichfield and Coventry. As many of the newcomers were skilled craftsmen and scientists, Birmingham's manufacturing capacity was greatly increased, so that it was able to make munitions on a large scale for Parliament, and afterward for William III. The large-scale development of smelting destroyed the neighbouring forests, and by 1728 Birmingham had abandoned the leather industry (*cf.* Sheffield). Cotton-spinning was begun, but abandoned owing to the high cost of transport from the ports. With the development of Huntsman's crucible-iron method Birmingham could no longer compete with Sheffield in the manufacture of cutlery, but early in the eighteenth century the introduction of brass gave a new direction to Birmingham's industries, on lines in which it subsequently became supreme. The brass industry was

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originally located near the calamine deposits of the Mendips at Bristol, of the Peak at Cheadle, and of Flint at Holywell. Brass-founding and the making of non-ferrous alloys eventually took the place of iron-smelting in Birmingham. Before the end of the seventeenth century nailers had settled near Dudley, and the gun trade had been established. Engineering was developed by Watts and Boulton, and the hardware industry was stimulated by the building up of the canal (1769), which brought coal from the mines. This made steam-power cheap, and the unusual enterprise of the working population led to the adoption of many new processes.

The introduction of gaslight in 1803 was followed by the manufacture of gas-fittings. Steel-pen, electric-plate, brass-bedstead, glassware, rolling-stock, electrical-plant, and motor-car industries followed. The reason for the continuous growth of the industries of Birmingham was the nodality of its roads, canals, and later railways, which connected the town with the colliery power centres on the one hand and with the ports and London on the other. This nodality did much to overcome the difficulty due to the high cost of power and raw materials. Nevertheless, these disadvantages led to a high degree of specialization in small finished goods—*e.g.*, jewellery—and their widespread nature and the diversity of the markets for the small metal industries have made it possible to avoid the chronic unemployment common in other metal centres.

Walsall (103,000 inhabitants) has had an industrial history similar to that of Birmingham, save that it has retained the leather industry abandoned by the latter town. Cycle saddles, dispatch-cases, and military equipment are made, together with other articles of small bulk and relatively high value.

The decline of the iron and steel industries of South Staffordshire should be noted. In 1865 there were 188 small furnaces, which produced about 15 per cent. of the total British output. The present annual output of iron is less than 500,000 tons, of which only an insignificant part is produced from the local ironstone of Bilston, Darlaston, Brierley Hill, Dudley, Wolverhampton, Wednesbury, Netherton, Tipton, and Walsall. The steel-works are found at

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Bilston, Birmingham, Round Oak, and Spring Vale. On the other hand, the non-ferrous metallurgical industries are prosperous, copper, aluminium, zinc, nickel, and cobalt alloys and salts being prepared for the local manufactures. Electrical manufactures are important, but the most striking developments have taken place in the cycle and motor-car industries, and have extended beyond the Birmingham, Dudley, and Wolverhampton districts to Derby, Southport, Bradford, Oxford, and the Thames valley. The canals of the Black Country still operate at a profit, and carry 8,000,000 tons of cargo per annum, two-fifths of the whole canal traffic of Britain.

In the early nineteenth century the development of new industries was encouraged by specially low tolls, and the owners of works situated on the canals still possess the right to take water for their works free of charge. There are, however, the great disadvantages of traffic being slow and maintenance costly.

The *East Warwick plateau* is much smaller and lower than that of South Staffordshire, but it has a considerable area of concealed coal capable of development. On the east an outcrop of ancient rocks provides material for the road-metal quarries of Hartshill, near Nuneaton.

Nuneaton (46,000 inhabitants) is the chief colliery centre, and Coventry (167,000 inhabitants), at one period famous for watchmaking and silk-weaving (*cf.* Saint-Étienne and Wandsworth), is now the chief motor- and cycle-manufacturing town. Silk ribbons are also made at Coventry.

The *Leicester plateau* rises gently from the Trent at Burton to the block of Archæan rocks which forms the barren district of the Charnwood Forest. Except for the quarries of Mount Sorrel, Groby, and Bardon Hill the Archæan ridges have little economic value, and are scantily populated. To the west, however, the Leicester coalfield has been worked for a century, its output being consumed chiefly in the neighbourhood of Leicester. Leicester (239,000 inhabitants), where the Roman road from Colchester joined the Fosse Way, became a Roman centre, "*Ratæ Contanorum.*" As it was accessible from the sea by the Soar river it remained

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prosperous in the Middle Ages, and developed into an important agricultural market. Leather and wool have always been important, and it has become one of the chief hosiery centres, power being obtained from the local coalfield.

The *Shropshire-Hereford uplands* average 500 feet above sea-level between the South Staffordshire plateau and the Welsh hills. They include four distinct groups, the Wrekin (Archæan), rising to 1300 feet, the Clee Hills (Carboniferous), the Longmynd or Church Stretton district (Archæan), rising to 1700 feet, and the isolated Archæan ridge of Malvern, rising to 1400 feet above sea-level. These areas were formerly worked for such minerals as lead, zinc, and iron, with copper near Llanymynech, but these are now exhausted, and the only minerals used are the igneous rocks quarried for road-metal and the limestones which are used as a source of lime and flux for the furnaces of the Black Country. This hill country of Shropshire and Hereford is mainly pastoral, cultivation being confined to the valley floors. It should be regarded as part of the Welsh uplands.

The **Triassic plain** (*b*) forms a horseshoe-shaped area whose tips reach the coast in Morecambe Bay and at the mouth of the Tees. The surface, however, is by no means uniform, as a number of low plateaux of Primary age occur as inliers (pages 489-493). Moreover, the surface of the Trias varies. In the Vale of York and in parts of Lancashire and Cheshire they are covered with varying thicknesses of glacial clays, the drainage of which is held up by the remnants of ancient terminal moraines in the neighbourhood of York, Selby, and Ellesmere. The lowest zone of the Trias is the Bunter Sandstone, which forms relatively unfertile soil, but is important for its water-containing quality. As in the Hardt of the Bavarian Palatinate, it was formerly covered by extensive woodlands, of which the Sherwood Forest is the largest remnant. These forests gave rise to leather and smelting industries over a very large area, but before the end of the seventeenth century the output of wrought iron had begun to decline, and the only places where iron is still made on a considerable scale are those which are close to or are under the coal measures.

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Nottingham (268,000 inhabitants), where a Red Sandstone hill commanded a convenient crossing of the Trent, was formerly a centre of charcoal iron-smelting, and is now the chief market for the collieries and metal-manufacturing centres of the Erewash valley and Mansfield districts. Much of the smoke-free coal used in London passes through the Trent Junction-Long Eaton district, where the railways of the Derwent, Trent, Erewash, and Soar valleys converge. Nottingham's lace and hosiery industries owe their existence to the streams of the Triassic sandstone, which provided soft water and power for the lace and cotton machinery set up there in the eighteenth century. The change of fashion in the present century, whereby lace has become less popular than hosiery and artificial silk, has been reflected in the fortunes of Nottingham's staple industries.

Derby (142,000 inhabitants), near the junction of the Derwent and the Trent, has harder water, and is much less important as a textile centre. Its command of routes through the Pennines led to its being chosen as the centre of the Midland Railway main route to Manchester and Leeds, while the existence of the lead-mines of the South Pennines was of value to its pottery industry (*cf.* Stoke). The existence of an important railway-engineering centre at Derby has led to the introduction of the motor industry.

Keuper marls and clay often overlies the sandstone, and give rise to marshy pasture- and plough-land. The Keuper rocks frequently contain salt (*cf.* Alsace, Stassfurt, etc.), and large quantities are extracted at Fleetwood, Northwich, and Greatham.¹ As the salt deposits are near coalfields and navigable rivers Britain has become the principal manufacturing centre of acids and alkalis and other basic materials of the chemical industry. Of the salt produced (2,000,000 tons per annum) 64 per cent. comes from Cheshire, 8 per cent. from the Tees' mouth, 14 per cent. from Fleetwood, and 9 per cent. from Worcestershire. Triassic rocks are easily eroded, and form the low-lying areas which are drained by navigable

¹ Note the present tendency for the chemical industries to be localized near the salt-works—*e.g.*, at Billingham, near Greatham, at the Tees' mouth, as at Fleetwood and Northwich. See page 453.

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rivers whose valleys contain stretches of fertile alluvium. The chief routes follow the river valleys—the Trent, the Severn, the Weaver, and the Dee.

2. The Secondary Scarplands

An escarpment is the denuded edge of an uptilted stratum of more resisting rock, the underlying layer of rock being less resistant, and as a result more easily worn away. As the layers of rock as a whole slope downward to the south-east, the escarpments of England usually face the north-west, so that there are two belts of scarp slopes crossing the centre of the English plain, generally in a north-east-south-west direction, where the harder rocks of the Jurassic and Cretaceous formations come to the surface. In the south-east an upfold of the chalk has been worn down by erosion, revealing older rocks in the basin of the Weald.

The **Jurassic uplands** (ci) possess features similar to those of the Cleveland Hills and North Yorkshire moors. Building stone is quarried at Yeovil, Chilmark, Doultong, near Wells, Bath, Minchenhampton, near Stroud, Cheltenham, Barnack, in Northants, and Ketton, in Rutland. There are important iron deposits similar to those of Cleveland at Westbury (Wiltshire), Hook Norton (Oxford), Kettering, Wellingborough, and other parts of Northants, while blast-furnaces are worked at Wellingborough and Kettering.

The low-grade iron ores (20 per cent.) are quarried from the Liassic marls, from the sands of the Inferior Oolite throughout the Uppingham countryside and into South Lincolnshire. In North Lincolnshire iron ores reappear near Scunthorpe, where self-fluxing ores have given rise to an important iron industry at Frodingham. The extensive development of these phosphoric ores, which contain some manganese, during the present century is due to the ease of quarrying them in open workings a few feet below the surface. This reduces labour and transport costs, and the reserves are sufficient to ensure continued development.

On both sides of the Oolite outcrops lie clay vales, the Liassic clays of the west giving rise to excellent cattle-

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fattening and dairy-farming pastures. In the case of beef cattle the animals are brought from other districts in the spring and sold for meat in the autumn. This leaves fields and farmers free for hunting in winter, especially in the neighbourhood of Market Harborough.

Throughout the Oolite country between the Trent and the Welland valleys the making of cheese (Stilton) is important; pigs are fattened on the dairy-farms; sheep are kept on the Oolite limestones, and careful breeding has been carried on for centuries, giving rise to special breeds of crossbreds, yielding excellent mutton and wool.

In the course of centuries the towns which commanded the routes between the agricultural clayland of the south-east and pastoral and wooded country of the Midlands became important centres of wool and leather industries. After the Industrial Revolution those that could easily obtain coal continued specialized forms of manufacture. Leicester, with Loughborough, Hinkley, and Castle Donnington, became a great hosiery and shoemaking centre, and the Cotswolds cradled the famous West Country woollen industry. Northampton, Kettering, and Higham Ferrers could not obtain coal locally, but became the centres of the boot and shoe industry. Northampton (93,000 inhabitants), the limit of navigation on the Nen in Anglian times, grew up round a Norman castle commanding a route across the Oolite ridge. During the Crusades civic rights were obtained, and the local pastures gave rise to woollen and leather industries. Lace, cotton, and silk (*cf.* Coventry) were also introduced, but all the textile industries failed because of their failure to adopt machinery. The construction of a canal which branched off the Grand Junction Canal ensured the supply of coal needed in the boot and brass industries, and Northampton became more important than its rivals, Daventry and Kettering, because it obtained railway communications with London, Peterborough, and Birmingham at an earlier date.

As in France, Germany, and Switzerland, the Jurassic iron ores have given rise to local iron industries, but the destruction of the forests, which allowed large numbers of small forges to exist in the Middle Ages, caused the gradual

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decline of iron industries and the metal-using industries which are important at the present day—*e.g.*, textile machinery at Leicester, electrical machinery at Rugby and Loughborough, and agricultural machinery at Lincoln are highly specialized, and generally produce articles of high value in relation to the amount of metal employed.

The **clay vales** (*āi*), which lie between the Jurassic and Cretaceous escarpments, are found in the Vale of Pickering, in Yorkshire, and in the district which lies between the Lincoln Heights and the Lincoln Wolds. They are widest in the Oxford plain, which lies between the Chilterns, the Cotswolds, and the Northampton uplands. All parts of the clay vales are agricultural. To the west and north-west the harder rocks of the Oolite escarpments dip under the more fertile soils of the Cornbrash and Middle Oolite formations. To the east a zone of Oxford or Kimmeridge clay gives rise to some of the most fertile land in England, especially where *débris* has been washed down from the limestone ridges, forming exceptionally fertile loam soils, which produce barley, roots, and wheat. In the region between Oxford and Aylesbury there is less glacial drift than in the valleys which enter the Wash, and this district is famous for the high value of its farms. Before the Industrial Revolution the zone of the clay vales was the most densely populated part of the British Isles, but at the present time, as a result of overseas competition, the clays are generally too expensive to work for grain, and the area under dairy cattle is steadily increasing.¹ The principal market towns are Malton (4400 inhabitants), at the outlet of the Vale of Pickering, Lincoln (66,000 inhabitants), Bedford (40,000 inhabitants), Aylesbury (13,000 inhabitants), and Oxford (80,000 inhabitants). The latter town lies at the junction of the Cherwell and the Thames valleys, at a point where a gravel belt which crosses the river alluvium offered room for settlement in the marshland. Originally a refuge, the draining of the surrounding district caused it to become a small medieval market, which owed

¹ The straw-hat industry of Bedfordshire has become a factory industry, *e.g.*, in Luton—using straw-plait imported from Italy and the Far East. Straw-plaiting lingers as a domestic occupation in one or two places.

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its rise to its university. Though ironstone occurs within a relatively short distance Oxford did not develop any metal industries until the present century, when methods of mass production and standardization made it as suitable as any other low-rated area for the manufacture of motor-cars. In the west Witney owed its woollen industry to the local fleeces and water-power of the Oolite uplands (*cf.* the West Country woollen industry).

The **Weald** (*cii-dii*) is a denuded anticline which was formerly covered by chalk. In age it is intermediate between the Jurassic and Cretaceous series, but in its influence on human conditions it more closely resembles the former. North of the Thames soil structure and drainage have been profoundly modified by the great ice sheet which formerly covered the Eastern Counties, but in the south there are few glacial deposits, and the underlying geological structure is reflected in the vegetation which covers the surface. As a result, there are great contrasts in the use which can be made of the soil, and agriculture varies from very good to very bad. Instead of the more or less uniform social and economic conditions which characterize the Eastern Counties and the clay vales, the Weald reveals social and economic contrasts which can hardly be paralleled in other parts of England. Many occupations are now so poorly paid that they have almost disappeared from the countryside. For example, it is improbable that there are more than a dozen men in the whole of Kent, Surrey, and Sussex who are still working as cleavers, and the charcoal-burner has almost entirely disappeared. Originally the chalk extended as a mountain fold from Hampshire to the Boulogne district, but continued denudation has exposed the lower rocks.

The *Forest Ridge*, or *High Weald* (*cii*), is composed of unfertile sandstone (Hastings beds) covered with natural heath and woodland of little agricultural value. Its iron ores, like those of the Lower Greensand, formed the basis of a formerly extensive smelting industry. The only important towns of the High Weald are Hastings (65,000 inhabitants), a popular coastal resort, and Tunbridge Wells (35,000 inhabitants), a fashionable coach-road spa of the early nineteenth century.

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The *vales of Kent and Sussex*, or *Low Weald* (*dii*), were formed by the erosion of the Weald clay belt which lies between the Lower Greensand escarpment and the forest ridge. The Weald was densely forested, and separated the agricultural groups which settled in South-east England after the end of the Roman occupation. The great forest which once covered practically the whole area between the North and South Downs was of oak, a timber peculiarly suitable for shipbuilding. Shipbuilding during the eighteenth century was one of the chief factors in the clearing of the Wealden forest. A few areas of woodland remain on land which cannot be cultivated. Pines are chiefly found on the sands and gravels, and oaks on clay and swampy soils. Toward the east, in the vale of Kent, the Weald is well cultivated; the greater part of the clay is under grass and woodland, with fields of roots, oats, and occasionally maize. Throughout the fertile Medway valley widespread deposits of brick-earth are under hops and fruit, while market-gardens and dairy-farms are common near trunk-roads and railways.

The *Western Heights* are an upland expanse of Lower Greensand covered with pine-woods and heather. Apart from a few tracts of alluvium, the highlands of the Hampshire-Surrey border were of little value, either as arable land or as pasture. With the exception of a few gipsies, squatters, highwaymen, and shepherds, they possessed few inhabitants before the present century, when the healthy atmosphere and fine scenery began to attract a residential population to the Hindhead district. The low agricultural value of the western heights renders this district peculiarly suitable as a training ground for war, and considerable areas have been reserved for military use. The towns of Alton, Farnham, Petersfield, and Midhurst command the routes leading from the Hampshire ports to London, and the recent development of motor traffic has done much to restore their importance as coach road towns. Though hops are still grown at Farnham, the acreage is steadily declining. Nowadays the moors are seldom used for sheep-grazing, and the old sheep fairs have been abandoned.

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Holmesdale is the long depression which lies between the chalk and Lower Greensand escarpments. The centre of the depression consists of fertile Gault clay, which, being too heavy to plough, is left under cattle pasture and woodland. Along its edges, however, there are narrow belts of fertile loam, which have attracted settlers from a very early date. The arable strip at the foot of the chalk escarpment is under grain, hops, and fruit, especially in Kent, while the poorer loams near the junction of the Gault and Lower Greensand produce crops of potatoes, roots, and oats. The sandy heath and woodland of the Lower Greensand escarpment rises to nearly 1000 feet on Leith Hill, but elsewhere its relief is less pronounced than that of the chalk downs.

The rich vale of Holmesdale was formerly one of the chief granaries of the London district, and there are still many good farms there. The gaps in the chalk ridge are occupied by market towns such as Maidstone, Sevenoaks, Reigate, and Dorking. Electric railways are rapidly converting these towns into suburbs of London, but it is possible to trace in the motor-body industry of Guildford and the flour industry of Dorking something of the former character of these towns as independent market centres. Throughout the Lower Greensand iron ore, water-power, and timber gave rise to numerous iron forges, which flourished greatly during the Tudor period, when armaments were required for the arsenals of London and Tilbury, and for the naval base of Portsmouth. The decline which followed was due to the gradual exhaustion of the more accessible timber-supplies during the seventeenth century and the subsequent migration of the industry to the coalfields.

The **chalk country** (*e*) forms a well-marked ridge of high land extending from Flamborough Head through the wolds of Yorkshire and Lincolnshire, the East Anglian Heights and Chiltern Hills, into a wide expanse of downland which reaches the coast at Purbeck, the Isle of Wight, Beachy Head, and Dover. In the north the chalk is hard, and forms very thin soils, but in many places there has been added a covering of boulder-clay which makes cultivation possible, at any rate on the hillsides. Less than a century ago the

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greater part of the chalk country of Yorkshire and Lincolnshire was rabbit-infested sheep pasture, but by combining sheep-rearing and grain-farming these areas are now among the richest agricultural districts in the British Isles. In the south the chalk is less hard, but there is no covering of boulder-clay, and the greater part of the downland remains as sheep pasture. In places the surface of the chalk is covered by clay with flints, and sufficient water remains on the surface to promote the growth of trees. The Chilterns have several fine beech-woods, which still supply material for the furniture-makers of the High Wycombe district. South of the Thames, however, the woods are of little value, and the chalk with flints is much too intractable to be brought under cultivation. Where the surface consists of chalk there are practically no streams, and as the drainage is everywhere underground the chalk forms a reservoir for vast quantities of water.

Early man was able to move more freely along the chalk ridges than in the more densely forested areas of the Weald and Thames basins, and the Pilgrim's Way between Canterbury and Salisbury Plain has been used since pre-Roman times. Where the chalk is breached by the Wealden rivers there are important gap-towns leading from the coast to London. Some of these are Canterbury (24,000 inhabitants), the focus of the commercial and military ports of East Kent and the ecclesiastical capital of England; Rochester, with Chatham, Gillingham, and Strood (150,000 inhabitants), where Watling Street crosses the Medway, a garrison city and naval centre since Roman times, with numerous cement-works at the present day; Dartford (29,000 inhabitants), a former shipbuilding centre, now chiefly important for paper-making; Croydon (233,000 inhabitants), whose small gap carried the first iron railway through the North Downs, and whose command of the traffic of the Brighton road has caused it to become the largest town in Surrey; Leatherhead, Dorking, and Guildford, commanding the coach-roads and railways to Chichester. Guildford, Farnham, Arundel, and Lewes occupy similar positions, but in every case the fertile land which gave importance to these towns is found outside

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the chalk. The villages lie at the base of the chalk escarpment or on the Tertiary soils, where a sufficiently large pure-water supply is available. In the west the chalk makes a semicircular outline round the Hampshire basin, and is continued along the Dorset coast and along the south coast of the Isle of Wight, where it reaches a height of 700 feet.

In parts of the Western Downs, which stretch from near Reading to Salisbury Plain, some areas of loam and clay occur, and arable farming is practised, especially on the lower slopes. In several of the valleys intermittent streams are ponded, and little villages have carefully regulated systems of irrigation. Salisbury (26,000 inhabitants) is the natural market for the Western Downs, and Winchester (23,000 inhabitants), at the former head of navigation of the Itchen, for those of Hampshire. Winchester was the centre of medieval trade in wool and wine, and, as the river was canalized, an *entrepôt* of trade with Venice.

The East Kent Coalfield. Outside the London area the only industrialized part of Kent is the group of towns which clusters round Rochester bridge. In addition to the Naval shipyards of Chatham and the cement-works at Strood there are steam-roller, tractor, and sea-plane works at Rochester itself. Most of these are specialized developments of earlier industries, and a further feature is the system of forts based on experience gained in the Crimean War. The construction of these forts made Chatham the headquarters of the Corps of Royal Engineers, who created in turn the sciences of military aviation, gas-warfare, and submarine mining. Apart from the making of rolling-stock at Ashford and of motor omnibuses at Maidstone the rest of Kent is purely agricultural.

In such an area the opening up of a coal and iron field cannot fail to have the most profound social and economic consequences. The coal seams have been brought to within 2000 feet of the surface in Armorican folds which are covered only by deposits of Secondary age. Fortunately the advice of a regional survey committee has been sought, and it is possible that the natural beauty of the region will be preserved.

An experimental boring undertaken when the Government

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stopped the Channel tunnel works in 1882 revealed excellent coal at Dover, but lack of capital prevented development. Pits, however, have now been sunk at Chislett, Betteshanger, Snowdown, and Tilmanstone. Working costs are high, and

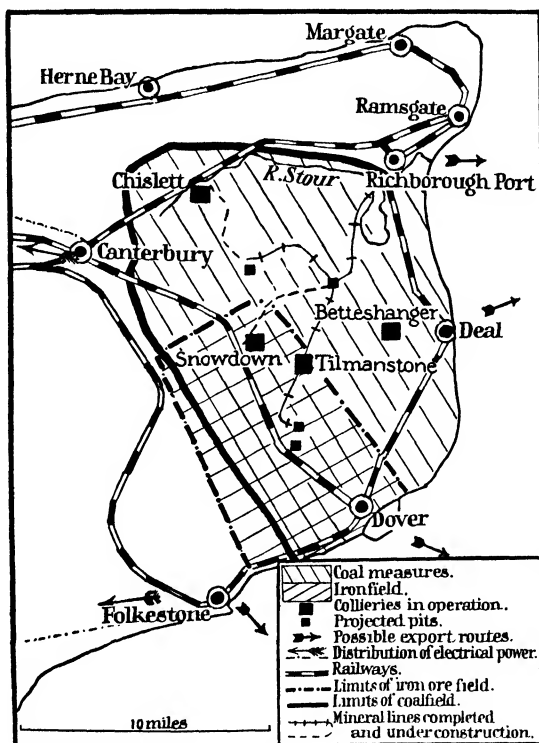


FIG. 101. THE EAST KENT COALFIELD

it is difficult to keep the pits dry, but the existence of iron ore above the coal attracted the attention of Middlesbrough ironmasters, who have taken over several of the collieries. Tilmanstone Colliery alone annually produces about 200,000 tons of coal, chiefly used in the cement-works of the Thames and Medway, but as both steam and gas coals occur it is expected that an iron and steel industry will be created be-

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tween Richborough and Fleet. The potential output of the whole field has been estimated at several million tons per annum, and it is probable that much of the coal raised will be used for the generation of electrical power. The output so far has not exceeded one million tons per annum, but an export trade is beginning to develop through Dover harbour, the coal being carried direct to the breakwater by overhead cables.

3. The Tertiary and Quaternary Lowlands

These lowlands stretch along the east coast from Bridlington to the coast of Kent, and on the south coast there are patches of alluvium in the marshes of Pevensey and Romney.

The **Hampshire basin** (fiv) resembles the London basin in being a chalk trough filled with Tertiary and more recent sediments and clays, or sands and gravels, as in the New Forest. The primitive vegetation of the sands was heath, that of the clay soils forest. A number of Saxon villages was destroyed to create the New Forest, a considerable portion of which still remains, and extends to the outskirts of Southampton. The poverty of the sandy soils of the west of the Hampshire basin has always made agriculture difficult, and the only important settlements are the coastal towns, Weymouth, Swanage, Poole, and Bournemouth. East of Southampton there is much cultivated land, with Chichester (14,000 inhabitants) as the market centre. Having become established as the chief fortress of the English Channel, Portsmouth (249,000 inhabitants) has remained a great naval base. The earlier naval port was Southampton (176,000 inhabitants), whose strong fortifications and superior inland communications made it the chief centre of medieval trade with Aquitaine and the Paris basin, but by the end of the eighteenth century it had become a sleepy seaside resort. It has now increased in importance because it is the only port near London which can accommodate the largest liners, its double tides giving an extraordinary depth of water. Southampton is the port where routes from London, the Midlands, and the North meet the great North and South

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Atlantic and Mediterranean routes. Its special function is the handling of passenger and express freight traffic, its cold storage for Argentine meat and warm storage for African fruit; its railway services enable it to dispatch rapidly parcels of fresh fruit and vegetables, frozen and chilled meat, wool, hides, and timber. Military routes converge on it from Aldershot and Salisbury Plain, and it maintains regular packet services with Havre and the Channel Islands, as well as liner services with North and South America, Africa, and the Indian Ocean. It ranks as the fifth British port in cargo alone, the chief imports being wool, meat, hides, fruit, vegetables, grain, dairy produce, and fuel oil, the latter being used for bunkering. Its exports are cotton goods, clothing, boots, and woollens. The popular summer resort of Bournemouth (117,000 inhabitants), where the sands reach the sea-coast, has developed from a mere hamlet in the course of a century, and the small coastal villages of the Isle of Wight have become popular summer and health resorts.

The coast between the Thames and Southampton Water has always formed England's gateway to the Continent of Europe, but the coastline and the principal lines of approach have themselves changed, and there is no supremely good natural harbour between Rochester and Portsmouth. The Roman ports, Reculver and Pevensey (Anderida), decayed, and were followed by the Cinque Ports, several of which, including Sandwich, Romney, Winchelsea, and Rye, were silted up.

The coming of railways created the Continental packet stations of Newhaven, Folkestone, and Dover, the latter port being converted at great cost into a Naval harbour. During the World War Richborough was used as a train-ferry port, and at the present time the air-port of Lympne has restored some of the former importance of Hythe. Ease of access from London is also responsible for the popularity of such coastal resorts as Margate, Hastings, Brighton, and Eastbourne, and it should be borne in mind also that the Channel coast is the sunniest part of the British Isles.

The Fens (fii) occur at the junction of the Yorkshire Ouse and the Trent (see page 461), and along the shores of the

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Wash. Formerly part of the sea floor, a great deal of fenland still lies below the level of high spring tides and is protected on the seaward side by dikes or by sand-dunes (*cf.* Holland). The surface consists of gravel, peat, and silt. Half the area of the Fens is occupied by peat, but no villages are built on this soil because of the difficulty of obtaining a good water-supply and firm foundations for houses. The older Fen towns were built at defensive situations at the limit of tidal navigation, or on islands of gravel, which were the only places offering protection from floods before the Fens were drained—*e.g.*, Ely and Thorney. Towns also grew up at or near the mouths of the rivers, and these became more important as ships increased in size.

The marshes and fens were originally the haunt of wild-fowl, eels, and fresh-water fish. The marsh pastures are used for cattle, but where more complete draining has been undertaken the marshes have been converted into rich agricultural districts, whose black soils produce fine crops of wheat, peas, beans, and roots. The present tendency is to substitute sugar-beet for potatoes, and to increase the area under market-gardens by the liberal use of manures. Small fruits are important at Wisbech, and bulbs near Spalding. Large crops of wheat and roots are still grown throughout the Fen districts. Lincoln (66,000 inhabitants), where the Oolite ridge is broken by the Witham, forms an easily defended site commanding the ford at the limit of tidal navigation. Two Roman roads and a canal (the Foss dike) leading from the Trent approached the same point, and as it was both a bridge- and a gap-town it became a great exchange centre for the produce of the Fens and a staple port exporting the wool of the Cliff Heath and of the Wolds. In the sixteenth century, when water-power machinery was introduced in other districts, its manufactures of scarlet and woollen cloth and of linen began to decline. With the draining of the Fens of the Witham by monks, and later (1572–1700) by the Dutch, its importance as an agricultural market increased, though there remain a few districts where wildfowl and geese are still to be found. Cattle-cake, flour-milling, and fertilizer industries are carried on, but as sea-going ships are

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now too large to sail up the Witham Lincoln is no longer a port, and Boston, the port at the mouth of the river, has relatively little overseas trade. The existence of ironworks in North Lincoln and the focusing of railways in the gap have encouraged the manufacture of agricultural machinery at Lincoln. This industry is shared by Newark, East Retford, Norwich, and Ipswich.

Cambridge (67,000 inhabitants) marked the first dry land (thirty-five feet O.D.) reached by boats sailing up the Great Ouse. Gravels provided a purer water-supply than is usual in Fen districts, and its bridge made Stourbridge a centre for the great fairs by which trade was formerly conducted. Its university, its railway communications, and the high agricultural value of the surrounding farms have maintained the town's commercial importance, and its university work has led to the creation of a scientific and mathematical instrument industry (*cf.* Göttingen). King's Lynn (20,000 inhabitants), at the mouth of the Great Ouse, may be compared with Boston in the decline of its overseas trade, and with Bruges in its efforts to maintain deep-water communication with the sea. The old port of Wisbech is now the centre of an important small-fruit industry.

East Anglia (fiii) includes areas of clay, chalk, loam, sand, fenland, and salt marsh, which, despite the variety of surface soil, form an economic unit based on arable farming. The region is the richest agricultural land in the British Isles, and possesses the most extreme climate in the country. The clay country consists of low plateaux and river valleys whose varied soils have given rise to different forms of agricultural development. In North-east Norfolk the soils are loess-like loams, which were brought under cultivation at a very early date. It was one of the first districts to adopt a system of crop rotation, using roots as winter fodder, and cattle were driven long distances—*e.g.*, from Scotland—to the autumn fairs, which distributed the cattle to the farms. Though less important than barley on the clay soils at the present day, much wheat is grown, and as the farms are relatively small this is one of few areas still inhabited by yeomen farmers.

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North-west Norfolk consists of sandy loams bordered by a strip of coastal alluvium. During the Middle Ages the sandy region was covered by heaths and woodlands, and the farms are consequently larger than in East Norfolk, but with the abundant use of manures fine crops of roots, barley, and wheat are now grown, and the coastal marshes form excellent summer pastures. The boulder-clay soils of South-west Norfolk and West Suffolk are much heavier than the loams, and were originally woodlands and heaths. Settlements were scattered, and at the present day many open commons remain. The boulder-clay districts are chiefly important for stock-farming for both meat and milk. The Essex boulder-clays are similar to those of Suffolk, and were formerly densely forested. The unfertile Epping and Hainault Forests are all that remain of what was formerly a barrier between the Anglian and East Saxon provinces.

The coastal area of South-east Suffolk consists of light glacial loams, sands, and gravels on which much heathland remains. Like those of Suffolk, the creeks of Essex were settled at an early date, and much wheat was grown on the London clay. At present large areas are dairy- or fruit-farms because of easy accessibility. Cheese is no longer made, the milk being carried to the London market. Near London the proportion of land under grass is exceptionally high (60 per cent.). In many of the coastal creeks of the Eastern Counties there are deposits of brick-earth which are sometimes worked as brickfields, the unused area being utilized as summer pasture for cattle. In the valleys there is often a considerable amount of river alluvium used for the intensive cultivation of vegetables—*e.g.*, in the Lea and Stort valleys. Norwich (126,000 inhabitants) was built on a hill of Norwich Crag, which offered a place of defence above flood-level at the head of a long estuary formed by the junction of the Wensum and the Yare. To the north-east the loams were under the plough, to the west and north lay pastures and woods, while in the estuary and on the coast fishing was carried on. Its position at the head of overseas navigation made Norwich the great centre of the wool-export trade of East Anglia during the Middle Ages, and its close

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commercial relation with Flanders brought a large number of skilled artisans from Bruges and Ghent during the Burgundian and French wars of the fourteenth and fifteenth centuries. Later refugee Huguenots introduced silk-weaving. The introduction of steam-power led to the migration of most of the East Anglian textile industries to the Northern coalfields and to specialization in those that remained, laces and silks. At the present day the principal industries are the manufacture of shoes, clothing, electrical and motor machinery, foodstuffs, and mustard. The city is a great corn and cattle market, and though it is off the main line of traffic between the North and London its distributing facilities make it an important regional capital.

Ipswich (87,000 inhabitants) is the second largest town in the Eastern Counties, the lowest bridge-town and the limit of ocean navigation of the Orwell. It has a considerable import trade in grain and oil-cake, chiefly from the Argentine, the Pacific coast of North America, the Black Sea, and India, each of which are markets for its agricultural machinery. Harwich (with Parkeston Quay) has a large sheltered harbour, and is used as a Naval base, a train-ferry and passenger port, and also as a port for the export of textiles and the import of foodstuffs and vegetables. It is essentially an out-port of London. Yarmouth and Lowestoft are the autumn ports for the herring fishery, the fish being cured for re-export. Both towns are summer resorts.

The tidal drift of beach material from the north-east blocks up many of the river-mouths with sand-bars and mud-banks, which are the centres of longshore fisheries—*e.g.*, Colchester and Whitstable oysters—but, as a rule, the coming of the railways has converted the fishing villages into seaside resorts, especially where the beach is of sand. Nearness to the Continent has made this coast a region of garrisons and small Naval ports—*e.g.*, Colchester, Rochester, Chatham, Sheerness, Tilbury, Harwich, and Gravesend. Southend (120,000 inhabitants) is a dormitory town and seaside resort maintained by the railway service with London.

In the west of East Anglia the chalk emerges from its covering of recent soils in the East Anglian Heights. Except

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where they are covered with younger deposits the thin chalk soils are seldom deep enough for the plough. Until the introduction of crop rotations they were chiefly sheep-runs, but the Industrial Revolution provided new markets for food and drained the clay areas of labour, so that it became more profitable to produce wheat on the chalk than on the clay, sheep taking the place of cattle as a source of animal manure. The villages in this district lie along a belt of water-bearing strata at the foot of the chalk slopes, except where the surface of the chalk is capped by clay. The present position of the chalk farms is one of geographical inertia in that the farmers cannot afford to let them relapse into sheep-runs and rabbit warrens. Barley, with turnips, and sheep are more important than wheat, which no longer realizes profitable prices. In the Breckland of the Thetford district, where the chalk is covered by sandy heaths, rye has replaced wheat, and as the area is an agricultural frontier such experimental crops as sugar-beet and tobacco are being tried.

The yeomen farmers of the sixteenth and seventeenth centuries were progressive in outlook, and embraced in succession new ideas in religion and politics, as did their neighbours in Holland. Their support did much to make Parliament victorious in its struggle with the monarchy, and even at the present day it is possible to find in remote villages little conventicles of the Peculiar People. In a very short time these sturdy and independent folk will be able to take advantage of the cheap electrical power provided by the overhead-wire system, and by using motor-lorries will be able to find a ready market for their produce in London. Already the new road passenger services are carrying the influence of London into the area lying north of Epping Forest, and a large number of new buildings are being erected in districts which were almost inaccessible from London less than ten years ago.

The **London basin** (fvi) occupies the greater part of the basin of the lower Thames east of the Goring gap. It consists of a chalk syncline bounded by the Chiltern Hills and the North Downs. The central part of the downfold is occupied by Tertiary deposits, chiefly London clay. The

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only variations in relief are afforded by the mounds of glacial material which cover the lower slopes of the Chilterns and extend southward as far as Hampstead Heath and the residual terraces of gravel whose unfertile nature has made possible their preservation as commons south of the Thames. In the south-west also are considerable patches of Tertiary sands, in the Aldershot, Chobham, Oxshott, and Woolwich districts. These form natural heathlands, and are of little or no agricultural value, the Bagshot sands of Aldershot and Chobham being used for military training, while Oxshott is under pines, heather, and mosses, a recreation centre within half an hour's journey from Central London. Along the lower courses of the rivers the clay is covered with alluvium, and in several places the gravel terraces retain loess-like deposits of brick-earth used for building and in market-gardens. Long ago practically the whole of the lower Thames was covered by forest and marsh, except where light loams and sands made clearing easy.

Gradually the woods have been cleared, the marshes drained, and the streams in the neighbourhood of London imprisoned in sewers. Close to the area built upon, however, it is still possible to find marsh pastures and fields of grain, and it is not difficult to visualize the London basin at the beginning of the nineteenth century, when nearly half the population of Middlesex, Essex, Kent, and Surrey lived in villages, as a well-cultivated, almost self-supporting, agricultural region.

To the north of the Thames the soil is more easily worked than in the south, and in pre-Roman times the area under cultivation centred in the St Albans district, north of the forest of Middlesex and Essex, which formed a barrier almost comparable with that of the Weald. The open country of the Chilterns and the Downs was more easily cleared, and gave easy communication along the chalk. Several fishing settlements were strung out along the banks of the Thames, but London offered few advantages before the Roman occupation. It is probable that several fords used at low tide existed at various points along the Thames, but there was not sufficient internal trade to justify the construction of a

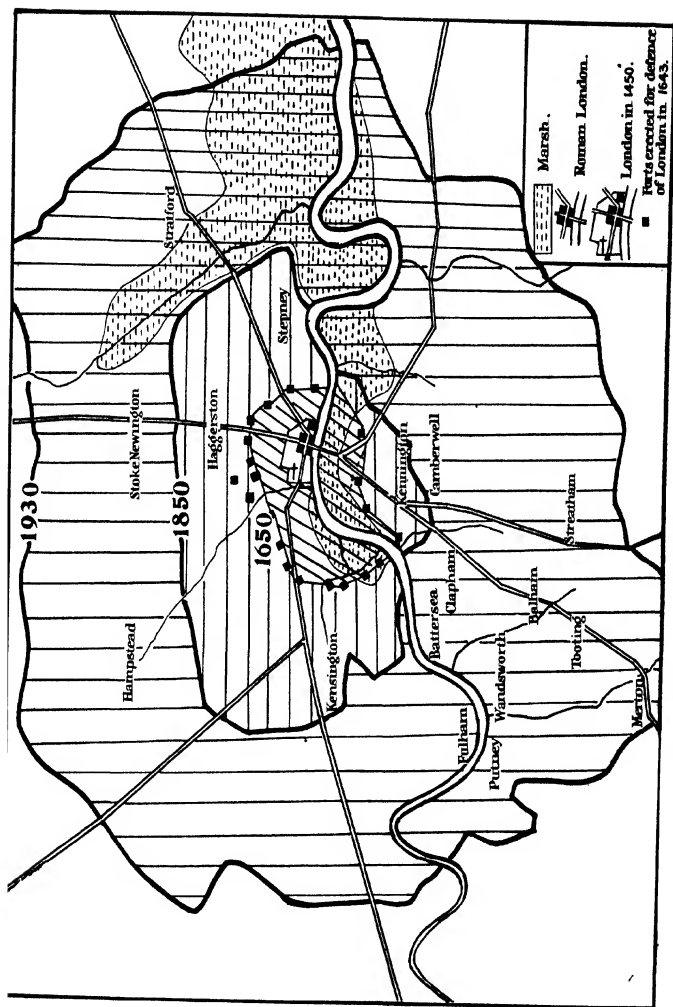


FIG. 102. THE SITE AND GROWTH OF LONDON

London originated at the lowest point on the Thames bridged by the Romans. The exact position was chosen because the north bank was above flood-level, and a short causeway across the marsh allowed Watling Street to be carried over the river. The bridge became the focus of Roman roads and the upper limit of overseas navigation until the nineteenth century.

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bridge. The Roman occupation was of a military character, involving the co-operation of naval and land forces; as part of the south-east coast had already been occupied, the construction of Watling Street had as its immediate object the subjection of the people living north of the Thames.

The place chosen by the Roman engineers for bringing their road across the Thames was determined by geographical conditions, and they built London Bridge at a point where relatively high land approaches the river on both sides. Here two creeks offered safe anchorage for the diminutive ships used in Roman times; one of these, the mouth of the Fleet, was in use until the eighteenth century.

Roman London was the chief port of entry into South-east England, but it was not until after the Roman occupation that the importance of the lowest bridge across the Thames was fully recognized. The clearing of the forests, the draining of the marshes, and the regulation of the streams by settlers from Continental Europe gave London a productive hinterland, and London Bridge became the great exchange centre of the Thames basin, practically the whole of the internal traffic being carried on by river-boats.

The choice of Westminster as the permanent centre of government, safe from attack by sea, made London a more important town than Bristol, York, Norwich, Chester, and Winchester, but it was to its position as the only large English river-port near the Strait of Dover and opposite the Rhine and Escaut, and to its security from invasion and civil disturbance, that London owed its more modern development under the Tudors. The Dissolution of the Monasteries opened up an era of commercial speculation, and the expulsion of foreign merchants and the development of an aggressive mercantile policy made London the great European *entrepôt* for Eastern trade in succession to the ports of the Spanish Netherlands, which were frequently rendered unsafe by civil, dynastic, and religious wars.

London had the greatest reserve of non-agricultural labour of any British town, its warehouses always contained raw materials, its merchants possessed abundant capital, its rivers provided an inexhaustible supply of water, and the

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discontinuance of feudal labour restrictions gave London a long lead before the Industrial Revolution. The Wandle and Lea valleys became important industrial areas, and several of the old water-mills are still in use. London's industrial importance has continued, though the absence of local supplies of coal and iron has caused the industries to assume a specialized character and to depend to an unusual degree on the cheapness of labour. This has involved the building of many cheap houses in the low-lying marshlands of the tributary valleys. Lambeth grew up along the Effra valley, Battersea along the Falcon brook, Wandsworth along the Wandle, and a number of industrial townships, such as Poplar and West Ham, in the lower parts of the Lea valley. The greater security of life and property in London than in most Continental cities attracted bankers and financiers of all nations, and though no longer invulnerable against aerial attack London is one of the greatest financial centres in the world. London's growth has been conditioned by the improvement of its external communications, canals which supplemented river transport being superseded by roads and railways, until at the present time London's population of nearly eight million people forms the greatest single market in the world.¹ To maintain its growth it has been necessary to extend the area from which it obtains its water-supply, and it has been proposed to construct reservoirs in Wales.

Geographical inertia is the principal reason for the importance of the present position of the port of London, and it is certain that if it had been built in the twentieth century London's bridge and docks would have been constructed much nearer the mouth of the Thames, and building-sites on Canvey Island and the Isle of Grain would have been extremely valuable. Already great transit docks have been built at Tilbury, and the problem of transporting goods from the docks to market has become acute, horse-drawn vehicles being used in the dock districts instead of motor-lorries because of the congested state of the streets.

¹ Urban development was determined by the framework of Roman roads, whose directions were subsequently followed by the underground railways. The earliest railway from Wandsworth through Mitcham was followed by more rapid growth in the south-west than in the south-east.

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More than 40,000,000 net register tons of shipping use the port of London annually. Grain (Millwall Dock), timber (Surrey Dock), paper-pulp and sugar (West India, East India, and St Katherine's Docks), fruit and meat (Victoria Dock), provisions and dairy produce, iron and steel, oils, tea, wool, and wine and spirits are imported. For most of these London is an *entrepôt* where goods are graded before being distributed to all parts of Europe. London is the world-market for wool, wine, tea, rubber, carpets, furs, and feathers, and of the 20,000,000 tons of merchandise which annually enter the port a considerable proportion is re-exported, the balance of the outgoing freights being made up of British manufactured goods, chiefly cotton and woollen cloth and engineering products.

One of the most remarkable features of the present century is the drift of population into Metropolitan England. With the introduction of alloys light engineering can be carried on wherever there is cheap transport, and most of the towns of South-east England have engineering-works, though the iron and steel industry is still localized in the industrial districts of the north and west. The number of products whose manufacture does not require unlimited amounts of power increases yearly, and London has become the chief manufacturing town of Britain. Manufactures which require large amounts of raw material are carried on near the docks. Thus West Ham manufactures chemicals, soap, and rolling-stock, Bermondsey leather, North London furniture, and Deptford paper, but little industries are found almost everywhere—*e.g.*, confectionery on the outskirts, beer at the artesian wells, clothing in the Oxford Street and Whitechapel districts, embroidery for the Navy at Clapham, tobacco in several districts, and sauces and tinned provisions in Lambeth and Wembley. With the development of efficient power distribution it is probable that the number of industries will increase, though the tendency is for the factories to be placed outside the London County Council area at easily accessible points where land and electrical power are cheap and local government rates low.

CHAPTER XXII

THE BRITISH ISLES: NORTHERN IRELAND AND THE IRISH FREE STATE—THE ISLE OF MAN—THE CHANNEL ISLANDS

IN three places the coasts of Britain and Ireland approach each other, but until comparatively recent times the passage of the Irish Sea was difficult, and often dangerous. This partly accounts for the hostility that, except during the period when Irish missionaries carried Christianity to Scotland, the peoples of Britain and Ireland have shown to each other. The Normans, assisted by Welsh levies, conquered the English Pale round Dublin; the Tudors broke Ireland up into counties, often dispossessing the native Irish; while the Protestant troops of Cromwell and William III completed the conquest in the seventeenth century. The latter received grants of land in payment for their services, and there grew up a feeling of bitter hostility based on deep-seated religious and cultural differences. This continued to the end of the World War, and in the granting of self-governing status to the Irish Free State the province of Ulster remained politically attached to Britain.

The physical regions of Great Britain are continued in Ireland. The worn-down Caledonian folds of the Scottish Highlands reappear in Donegal and Mayo, the north-eastern uplands of Ireland are a continuation of the Lower Primary folds of the Southern Uplands of Scotland, the south-east uplands of Wicklow correspond to the uplands of Wales, while the south-western ridges and valleys are a continuation of the Hercynian folds of South Wales and Devon and Cornwall. The rest of Ireland consists of a great plain of Carboniferous Limestone drained by the Shannon, Erne, Liffey, and Boyne rivers and capped in the north-east by the lava plateau of Antrim. Near the mouth of the Shannon the limestone plain is pierced by the older rocks of the Slieve

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Bloom and lower Shannon uplands, and as the whole of Central Ireland was formerly under ice there are numerous eskers and drumlins of glacial origin. The solvent action of peaty water accounts for the existence of lakes in the Shannon valley, and the absence of efficient drainage is responsible for the great extent of the bogs.

NORTHERN IRELAND

The passing of the Government of Ireland Act was followed by the establishment of separate Parliaments for Northern and Southern Ireland. Northern Ireland continues to send representatives to the British Parliament, but the Irish Free State is an independent nation with the same status as the self-governing dominions.¹

The boundary between Northern and Southern Ireland follows a zone occupied by both Protestants and Catholics, and the actual frontier was fixed by compromise, and has little geographical basis—*e.g.*, the greater part of the basin of the Erne is in Northern Ireland, but the outlet in Donegal Bay is in the Irish Free State. It should be noted that there are some who believe that eventually common interests may bring about the political reunion of Ireland under an Irish Parliament, but it must also be kept in mind that more than nine-tenths of Southern Ireland is Roman Catholic, while more than half of the people of Northern Ireland are Protestant, of whom more than a quarter are Presbyterians.

Northern Ireland consists of the Sperrin Mountains, a continuation of the crystalline mountains of Donegal, the basalt plateau of Antrim, a source of iron and aluminium ores, the New Red Sandstone valleys of the Laggan and Blackwater, containing the Dungannon or Coal Island coal-field, and the continuation of the Southern Uplands of Scotland in the Mourne Mountains and adjoining hill country of Down and Armagh.

The Sperrin Mountains are little inhabited, but with the exception of the granite heights of the Mourne Mountains

¹ It should be remembered that the term Ulster is not synonymous with Northern Ireland, part of Ulster being in the Free State.

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the lower slopes of the south-eastern uplands of Ulster are under the plough and produce wheat and flax. The Triassic soils of the Laggan and Blackwater have been enriched with materials derived from the upland districts, and form rich dairy-farming and cattle-fattening districts. More than 60 per cent. of the milk produced is made into butter for export to Glasgow, Ayrshire, and Lancashire, and there are a large number of co-operative creameries, which return the separated milk for the rearing of calves and the fattening of pigs. The chief butter district, however, lies in the south-west, where Northern Ireland includes part of the central plain in the Erne basin, Enniskillen, Newtownards, and Omagh being the chief markets. The basalt plateau is drained by the Bann, which, in its fertility, resembles the valley of the Laggan. Here, as elsewhere, farms are small; more than 86 per cent. of the holdings contain less than thirty acres.

Nearly three-fourths of the surface of Northern Ireland is under cultivation. Everywhere potatoes are grown as sustenance crops, and there is a considerable surplus for export. Live cattle are also exported in large numbers. The system of small-holdings encouraged the cultivation of flax, and the soft water of the rivers was suitable for retting. Linen manufactures developed with the introduction of spindles and looms brought from Holland during the reign of William III. It was not until the decay of the Irish woollen industry that Ulster began to develop linen manufacture on a large scale. Two factors limit the flax output of Northern Ireland of to-day, the low price of cotton and the cheapness of Russian fibre. At the present time the bulk of the fibre used is imported, and the Irish linen industry has developed along specialized lines. There is a close connexion with the Lys district in Belgium, which supplies some of the linen for finishing. Londonderry specializes in shirts, Armagh in brown holland, Lurgan in bleaching, and Belfast in all grades of linen production. In the latter town the existence of ship-yards employing male labour keeps down the cost of production in the linen-mills, which employ women. Northern Ireland has one-third of the world's flax spindles, and is the chief centre of linen manufacture in the world. Smaller

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quantities of cottons and woollens are also made. The other great industry is shipbuilding. Small wooden ships had been built at the mouths of the rivers, and the Belfast yard was unimportant until the mouth of the Laggan was dredged, Clydeside workmen were introduced, steel ships were designed, and the Suez Canal was opened. The tonnage produced at Belfast (100,000–150,000 tons) is smaller than that of the Clyde and north-east coast of England, but some of the largest liners used in the transatlantic trade are built there.

Belfast (415,000 inhabitants), the lowest bridge-town of the Laggan, faces Britain, and is the chief port and the capital of Northern Ireland. Through its docks pass the dairy produce, potatoes, cattle, herrings, and linen of Northern Ireland and the maize, fertilizers, and manufactured goods imported. More than 1,500,000 tons of Belfast trade is with foreign ports, chiefly American. Its linen industry utilized the water-power of the local streams, but power is now obtained chiefly from coal imported from Scotland. Coal has been reached at Coalisland in a boring at a depth of 600 feet, but up to the present mining has not developed. There are a number of minor industries, such as whisky, tobacco, and rope. The only other important town is Londonderry (45,000 inhabitants), which shares in the shipbuilding, linen, and rope industries of Belfast, and imports quantities of maize direct from foreign ports. Its outpost, Moville, is the mail port for Canadian liners.

THE IRISH FREE STATE

The area occupied by the Irish Free State corresponds closely to that of the ancient provinces of Connaught, Leinster, and Munster. The Anglo-Norman invaders established themselves along the coast of Meath, and the Pale was created to secure Dublin, which thus became the great centre of trade relations with Britain, and as it was also the capital it developed into the only large town in Southern Ireland. Except in the Dublin district, the combination of high humidity and mild winter and warm summer conditions

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has caused Ireland to remain an almost purely pastoral country. In consequence, the population tends to be evenly distributed, except where mountains and bogs cause even scantily populated districts to be regarded as 'congested.' Cattle, horses, oats, and potatoes are the principal products of agriculture. Surplus cattle are exported *via* Dublin, Ross-lare, Waterford, and Cork, and the dairy industry has now entered the stage of co-operative production and marketing. Ireland has the finest climate for dairy-farming in the whole of Europe, but technical knowledge is less developed than in Denmark, and civil disturbances since 1914 frequently resulted in the burning of the local co-operative creameries.

As in the case of other purely pastoral countries, Ireland has sent out large numbers of emigrants, harvest-workers to Great Britain and permanent settlers to America.

The present policy of the Irish Government is to develop self-supporting agriculture and to make use of mechanical power on the farm. The use of electricity will cheapen the cost of tillage and brighten the farmer's life. Between Killaloe, the outlet of Lough Derg, and the tidal water at Limerick the Shannon has cut its way through the lower Shannon uplands. Here has been constructed the Ardnacrusha power-station, with a fall of water of nearly a hundred feet. It is proposed to develop 180,000 horse-power, which will be distributed by overhead wires to all parts of the

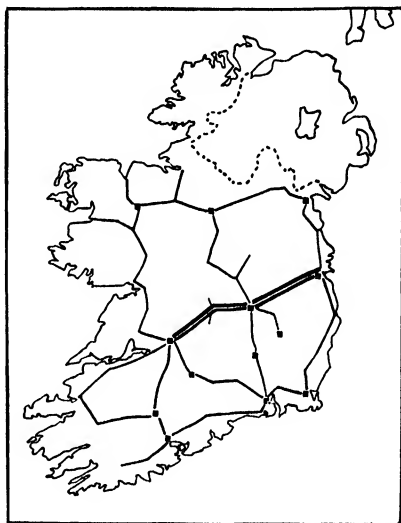


FIG. 103. SHANNON HYDRO-ELECTRIC POWER DISTRIBUTION SCHEME

The double lines represent 110,000-volt transmission lines. The single lines represent 35,000-volt transmission lines.

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Free State, the main transmission lines being from Limerick to Dublin and Cork. Though more than a hundred towns and villages draw current from the Shannon, Ireland's annual consumption of electricity per head is the lowest of all the countries of Western Europe. It is hoped to raise the amount to thirty-seven units per head, and many of the Irish farmers have already adopted electricity for use on their farms. Yet unless the Irish farmer changes his methods he is doomed to failure. At present the Irish Free State is little more than a ranch, and the area under crops other than hay has decreased from 3,500,000 acres in 1851 to 1,500,000 acres in 1926. The area under hay increased during the same period from 1,000,000 acres to 2,250,000 acres, and the Irish farmer appears to be satisfied with the minimum quantity of crops needed to keep his cattle alive. The Irish butter trade is confined to the summer months, whereas that of Denmark is carried on throughout the year. Improved methods of production and marketing would enable Ireland to take the lead in supplying Britain not only with cattle, poultry, and eggs, but also with butter, bacon, and potatoes.

Physical Regions

The **western and north-western highlands** are composed of hard Archæan rocks, except in the coastal lowlands near Ballina, Sligo, and Ballyshannon. Remoteness from markets renders fishing unprofitable, and the people live in a state of poverty, cattle, pigs, and human beings sharing the same hovels. During the nineteenth century thousands of peasants gave up the struggle to exist there, and migrated to the east of Ireland or left the country. Since the Free State became independent, however, the number of emigrants has decreased. The fishing-port of Galway (13,000 inhabitants) possesses one of the finest natural harbours in the British Isles, but the absence of a productive local hinterland and the inaccessibility of markets render it unimportant, the only product capable of development being woollen cloth.

The **south-western uplands** are east-west folds of Old Red Sandstone, the valleys being prolonged under the sea

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in Dingle Bay, the Kenmare river, and Bantry Bay. The south coast rivers break through the ridges, the passes formed being used by the roads and railways. Throughout the south-west the climate is extremely mild, and vegetative growth is practically continuous. Milk is the principal product, and is condensed for export at Clonmel and Tipperary; in the latter casein is also manufactured. Fishing is carried on off the coast for local consumption, and preparations are being made to develop a large-scale fishing industry.

Here, as in Western Ireland, local wool is converted into cloth by hand-loom. Each of the south coast ports possesses hand-loom, fishing, and dairy industries. Cork (78,000 inhabitants) is the second largest town in the Irish Free State, with important transatlantic and coasting services at its outport, Queenstown (Cobh). Shipbuilding is carried on.

The **south-east highlands** are a continuation of the Welsh upland region, and, like it, possess small quantities of gold, copper, and iron pyrites. The Wicklow Mountains consist of granite, and separate the Wexford-Waterford plain from the plain of Central Ireland. Except along the east coast, communications are easy, being provided by the Suir, Nore, Barrow, and Slaney, which have cut broad valleys through the crystalline uplands. The valleys are fertile, and produce wheat in addition to oats and fodder crops.

Wexford (11,000 inhabitants) and Waterford (27,000 inhabitants) have oyster fisheries and manufacture agricultural implements. Rosslare, the outport of Wexford, is connected by regular steamer services with Fishguard, the passenger port of the Great Western Railway. Coal is mined in a synclinal basin in the Kilkenny and Carlow districts. Here there are ample reserves, but the output, which has never exceeded 110,000 tons, is only used in local industries.

The **limestone plain of Central Ireland** is rich grassland where store cattle are bred, being collected at Ballinasloe and other cattle markets for export to Liverpool and Holyhead, or for fattening near Dublin and Belfast. The little towns of the plain produce homespun cloth and hosiery, the chief market being at Carrick, while the Church fosters embroidery, lace, and crochet-work. Tanning and dairy-

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farming are general, and the larger towns have breweries or distilleries.

The Shannon should be compared with the Severn. Its upper basin occupies the whole of the centre of Ireland, where tributaries gather from ill-defined watersheds, of which the most characteristic is the Bog of Allen, the common watershed of the Boyne, Barrow, and Brosna rivers. Here peat is the commonest fuel, but up to the present it has little value in commerce. The main stream flows directly through a number of lakes before entering Lough Derg, but as the area has been recently glaciated the drainage of most of the streams is immature. Below Lough Derg the Shannon enters a narrow gorge in the lower southern uplands (*cf.* the Severn Gorge), and falls to sea-level in the fertile Shannon flood plain, where the pasture is particularly good.

Limerick (40,000 inhabitants), the lowest bridge-town, is still a sea-port and the chief market of the Shannon basin for dairy produce, pressed meat, leather, and grain. It also possesses tobacco, lace, tinplate, and engineering industries. The opening of the Shannon hydro-electric power-station at Ardnacrusha may cause it to develop large-scale industries.

The eastern coast is more highly developed, Drogheda and Dundalk sharing in the linen industry of Ulster.

Dublin (418,000 inhabitants), the bridge-port of the Liffey, has always been the gateway into Ireland from Britain. An invader's capital, all communications radiate from it, and it remains the capital of independent Ireland. In 1649 the port had a depth of six feet, but by dredging this has been increased to thirty-two feet, so that vessels of 12,000 tons can find accommodation. Being opposite industrial Lancashire, it exports Irish farm produce in exchange for English manufactures, and possesses the usual brewing, distilling, leather, chemical, and textile industries—*e.g.*, poplin of the Irish plain—but on a larger scale than elsewhere.¹ Kingstown (Dun Laoghaire), the port of Dublin, has regular services with Liverpool and Holyhead, to which ports cattle

¹ Two of the three million inhabitants of the Irish Free State are engaged in agriculture, and there is a natural exchange of the products of England and Ireland. The Irish Free State annually imports £36,000,000 worth of British manufactured goods (*cf.* U.S.A., £46,000,000).

THE ISLE OF MAN—CHANNEL ISLANDS

and dairy produce are sent in exchange for manufactured goods. There is also a large cross-channel passenger trade. In 1930 the tonnage of the port was 2,500,000.

THE ISLE OF MAN

The Isle of Man is a detached portion of the Cambrian uplands lying midway between Lancashire and Ireland. Ores of lead, copper, and zinc have been mined there, oats are grown, and milk cattle kept. There is also a fishing industry, but the main source of revenue is the summer visitors, steamer service being maintained between Fleetwood, Heysham, and Liverpool and Douglas, the chief Manx port.

THE CHANNEL ISLANDS

These islands belong to the United Kingdom, but geographically are part of Brittany. They produce early vegetables and fish, and are summer resorts. Weymouth and Southampton maintain regular steamship services.

CHAPTER XXIII

SCANDINAVIA: NORWAY, SWEDEN, AND DENMARK

THE SCANDINAVIAN PENINSULA

SINCE the only land communications between Norway and Sweden and the rest of Europe lie across the thinly populated Finnish plateau, Scandinavia may be almost regarded as an island. This insularity has preserved racial characteristics and customs and has encouraged the policy of neutrality in European affairs. At times Norway and Sweden have entered into political union with Denmark, but such associations have been of a temporary nature, and both the Storting of Norway and the Riksdag of Sweden have claimed to control the Government of their respective countries even during periods of dynastic union.

In both countries the settlement and development of the people have been strongly influenced by physical conditions. The lowering of the level of the sea during the post-glacial period exposed a coastal shelf in Norway and provided the only considerable areas of arable land in the peninsula, which consists of hard and ancient rocks with a thin covering of poor soil. Two-thirds of the entire population of Norway live on the coasts and up the fjords. Less than 3 per cent. of Norway is cultivated, and less than 1 per cent. is under grain.

As the eastern and southern parts of the peninsula are lower and are partly covered by Quaternary soils, Sweden has a larger part of its area (10 per cent.) under the plough, and more of its population is found in inland districts. As its density of population is less than twenty persons per square mile, Norway is the most thinly populated country in Europe. Sweden is somewhat more densely peopled (thirty-six per square mile), but in both states the absence of soil and the very severe climatic conditions cause the interior highlands to be almost uninhabited.

THE SCANDINAVIAN PENINSULA

Except in the neighbourhood of the Skager Rack, where the states meet in the south, the more densely populated districts of Norway and Sweden are separated by high, unproductive country. This helps to explain why the political development of the two countries has been along different lines. As life in the little settlements scattered along the west coast is highly localized and self-supporting, the Norwegians have always had a large measure of self-government. On the east, however, inland communications are easier, and there has been much closer contact with the countries of Continental Europe. A modified form of feudal government was established in Sweden by the end of the thirteenth century, though the peasants were frequently in revolt. In few Teutonic countries has the idea of personal freedom been maintained so strongly as in the Scandinavian peninsula, and particularly so in Norway.

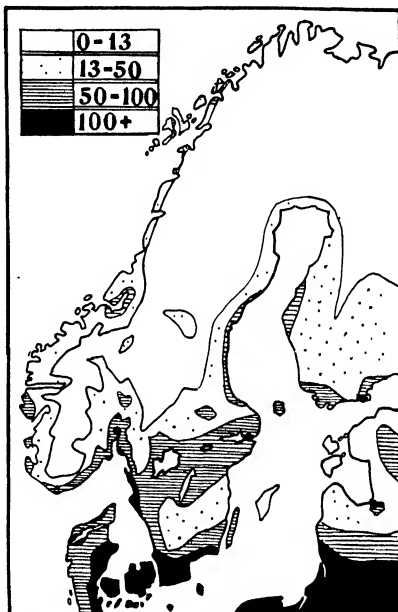


FIG. 104. SCANDINAVIA: DENSITY OF POPULATION PER SQUARE MILE

Norway owes its independence to its being separated from Sweden by an uninhabited cold desert.

Physical Regions

The **Scandinavian highlands** or plateau represents the elevated stumps of old Caledonian foldings. Gneiss, schists, and granite prevail, but there are large areas of Primary sandstones and limestones. All give relatively poor soil. In many parts glacial moraines cover the surface, and do not add to its fertility. The peaks of the plateau are in places

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a little over 8000 feet above sea-level, and there are considerable areas where snow collects and gives permanent icefields. The plateau faces the Atlantic with a relatively steep fault face trenched with many valleys, which, as a result of drowning, are now partly occupied by the sea.

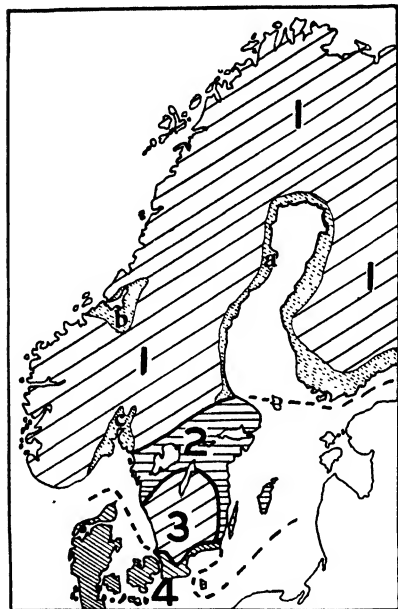


FIG. 105. PHYSICAL REGIONS OF SCANDINAVIA

1, the Archæan Fenno-Scandian plateau; 2, the Primary lowland of Central Sweden; 3, the Archæan plateau of Småland; 4, the recent plains of Scania and Denmark.

a, the Bothnia coastal plain; b, the Trondheim depression; c, the Oslo valleys, which possess a considerable amount of cultivable soil.

The strandflat, or rocky platform along that coast, is cut into numerous small islands. The eastern slopes toward the Bothnia Gulf are more gradual.

The keel or line of greatest height of the plateau roughly marks the frontier between Norway and Sweden in the northern but not in the southern parts. It lies not far from the Atlantic edge of the plateau. In a few places the plateau allows comparatively easy crossings to be made, at the head of Trondheim Fjord and between Trondheim Fjord and the south of the Glommen valley. Population in the plateau is confined mainly to the coasts, in the west on the islands of the strandflat and on small alluvial plains in the fjords, and in the east on

the broad strip of new deposits which make the low coast of Sweden. On the uplands of the north there are wandering Lapps, with their herds of reindeer. Farther south the uplands are little used, and a scanty population is confined to the valleys.

The **Primary lowlands** of Central Sweden lie between the

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Baltic and the Kattegat in the region of the great lakes, which mark the ancient sea connexion between the Baltic and North Seas before the channels through the Danish islands were formed. A great part of South and Central Sweden and the islands of Gotland and Öland are built of Lower Primary rocks, but glacial clays and gravels cover large areas, and there are numerous lakes, especially at the junction of the Archæan and Primary formations (*cf.* the glint line of Estonia). The areas in which the great lakes lie are clay plains which form the chief agricultural districts of Central Sweden. These lakes have contributed to a great extent to the early development of the central districts, which are now the principal region of industrial activity in Scandinavia.

From the earliest times these inland waterways have facilitated communications between the western and eastern coasts, and have made it possible for Sweden to develop into a national unit. The Trollhättan and the Göta canals were completed in 1832, and link Stockholm, the great lakes, the Göta valley, and Göteborg. Only sixty-four miles of the route between Göteborg and Stockholm are entirely artificial, the remaining 180 miles consisting of canalized natural waterways. Vessels of 1200 tons can reach Lake Vänern, but cannot go farther east, where the Göta canal can take only vessels of small size. The number of locks makes transit slow. The basin of Lake Vättern is the reservoir for all the streams which enter the Göta river and reach the sea at Göteborg. At Trollhättan a great volume of water passes over the falls, which are at present the chief source of electrical power in Southern Sweden. In the district between the clay plains of Central Sweden and the Dal river is the iron district of Bergslagen, where the occurrence of ore and water-power gave rise to a very ancient iron industry. In the "Iron Belt" occur the best mines, and as the deposits are near the surface the iron is quarried (*cf.* the Lake Superior ores). This reduces the cost of mining.

The **Småland plateau** lies in the centre of Southern Sweden at an average height of 600 feet. It is a detached piece of the Archæan and Primary plateau of the north.

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Its surface is marked by rocky hills and moraines clothed with pine-forests. There are many irregular lakes and marshes. These lakes make it possible to utilize the water-power of the rivers which radiate from the plateau and descend in a series of waterfalls to the coastal and central plains.

The **plain of Skåne** (Scania), in the extreme south of Sweden, is composed of low-lying rocks of Triassic, Jurassic, and Cretaceous age, similar to those of Denmark. In parts the surface consists of Quaternary clays and sands, and the whole region is astonishingly fertile. In the Jurassic deposits there are thin seams of coal. Little of the coal is worth mining, except where it is found with fireclays, as in the Höganäs and Billesholm districts, where it forms the basis of local industries. This is the richest agricultural area in Sweden alike for crops and for cattle.

Climate

In spite of its northerly position Scandinavia enjoys an exceptionally favourable climate on account of the prevailing oceanic winds and the North Atlantic Drift, which washes the Norwegian coast and also penetrates into the Skager Rak. These give the Norwegian coasts a relatively warm winter climate, and also tend to mitigate the cold winters of Sweden. There is a considerable difference, however, between the climates of the east and west coasts. The climate of the Norwegian coast is maritime, and frequently places near the Arctic Circle are as warm in winter as those on the Bay of Biscay. The period of warmth in summer, however, is frequently too short for the cultivation of wheat, though owing to the continuous summer sunlight which occurs over a quarter of the peninsula barley ripens in between fifty-five and sixty days. Norway is the only country in the world where cereals are regularly grown for food within the Arctic Circle. Being sheltered from the strong winds which sweep the uplands, several of the fjord towns possess sub-tropical plants—*e.g.*, Bergen—and, with the exception of the Trondheim districts, few parts of the Nor-

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wegian coasts and fjords experience a month's continuous frost in winter. On the east, however, the peninsula is open to east winds, which make the winters of the eastern lowlands of Sweden very cold, and practically the whole of the eastern lowlands have at least two months' frost.

The west coasts alone are under the influence of the westerly and south-westerly winds of the Atlantic depressions, which bring rain at all seasons. In the extreme north, at Vardö, the daily mean temperature ranges from 48° F. in August to 21° F. in January, but elsewhere the temperature seldom falls below freezing-point until January. February is the only month when frost conditions are general. On the islands the summers are cool, but in the sheltered fjords the continuous sunlight sometimes gives very hot weather, and at Sydvaranger and Trondheim temperatures of 88° F. have been recorded. Precipitation is high, especially on the coast, where rain occurs on two hundred days and snow on seventy days in the year. Fogs are infrequent, and occur chiefly in summer.

The south-eastern valleys of Norway occasionally have high summer temperatures, being sheltered from the full force of the rain-bearing westerly winds. In the district round Oslo the July temperature averages more than 60° F. In winter, however, South-eastern Norway is cold, and the country is generally frostbound from December to March. In the eastern valleys, which are subject to easterly winds in winter and spring, the mercury in thermometers has often been frozen, and land-fog drifts down the valleys and renders winter navigation dangerous in Oslo Fjord, and even in the Kattegat. The annual rainfall near Oslo is less than twenty-five inches, and resembles that of Sweden.

Sweden has continental conditions, but, owing to its great longitudinal extent, there are considerable variations in its climate. In Skåne the warm season lasts for four and a half months, and in the winter the country is frostbound for little more than two months. In the north, however, in the neighbourhood of Haparanda, there are less than three warm months, while wintry conditions continue for more than half the year. The rainfall of Eastern Sweden averages from

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twenty to twenty-five inches, but, owing to the shelter of the uplands to the west, parts of the northern provinces have only eighteen inches. In Sweden most of the rain falls in autumn and early winter, though rain is seldom absent for long in the uplands.

On the highlands the winds are strong, even in summer, and upward of forty inches rainfall a year makes it impossible for hay to be dried in the upland pastures. Rain falls in all months, but principally in autumn and winter, and when cut the grass is allowed to slide down steel wires into the valley below, where it is placed on poles and fences until dry enough to be put into winter storehouses, 'stabburs.' The highest ground lies above the snowline, and there are a number of glaciers, which, however, do not reach sea-level except in Jökulfjord, in the far north. About 2000 square miles are occupied by ice. The plateau is never warm, and winter anticyclones give rise to very low temperatures, fifty degrees of frost sometimes occurring at 2300 feet. These low temperatures are due to the excessive radiation of the long winter nights. The temperature is below freezing-point for nearly half the year in the west of the plateau and for two-thirds of the year in the north and north-east. Toward the west the rainfall of the plateau is high, but inland precipitation decreases rapidly, less than twelve inches occurring on the east of the Dovrefjeld. The pole of maximum cold in Finmark has a January mean temperature of 4° F. (*cf.* the Siberian pole, - 58° F.).

Climatic conditions favourable for cultivation exist in little more than one-tenth of the total area of Scandinavia. Consequently there has been a continuous stream of emigration both from Norway and from Sweden. With the exception of Ireland, Norway has lost a larger proportion of her population (one-eighth) than any other country, chiefly to the United States. Moreover, a considerable proportion of the coastal people is engaged in fishing, and no less than 6 per cent. of the people are dependent on the Norwegian mercantile marine. In the past people of Swedish birth have emigrated in large numbers to Baltic countries, and especially to Poland, but at the present time the chief field of emigration

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is the United States and Canada, which give shelter to more than one-tenth of the Swedish-speaking people.

Plant and Animal Life

Scandinavia shows a gradual range of plant zones between the mountain peaks and sea-level, and between north and



FIG. 106. A LAPP HUT

Local materials are used in the construction of the dwellings of the Lapps of the plateau of Northern Sweden, the smoke being allowed to escape through a hole in the roof. In some of the more permanent huts brick chimneys are now used.

By courtesy of the Swedish Travel Bureau

south. In the north tundra and Arctic fjeld begin at little more than 1000 feet above sea-level, and extend throughout

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the plateau as far south as Dalecarlia, where they begin at 3000 feet. Below the fjeld is a narrow zone of birch-woods which reaches sea-level in the north. Farther south this zone is succeeded at lower levels by pine-forests which cover one-fifth of Norway and more than half of Sweden. The forests are rather monotonous, and consist chiefly of two species, the spruce and the pine. In Central Sweden the oak, elm, and ash make their appearance, and in the extreme south beeches occur, though much of the forest has been cut down and the land is now under cultivation. Half of the total surface of Scandinavia consists of bare rock or is covered with Alpine and Arctic plants; 45 per cent. of the area is forested, while the remaining 5 per cent. is either permanent pasture or arable land.

In Norway nearly three-quarters is moorland and waste, one-fifth is under forest, and only one-fiftieth is suitable for cultivation. Pine-forests are found chiefly in the south-east, where they shelter the elk and roe. In the strong winds of the west coast the upper limit of trees descends. The spruce struggles to maintain a hold in the sheltered valleys, but is almost entirely absent from the western fjords. Near Trondheim, however, there is a great deal of cultivated land, and spruce is found everywhere on the slopes, with mosses and bilberries as undergrowth. Beyond the Arctic Circle the spruce-woods disappear, and pines are confined to the sheltered inland valleys, with scattered clumps of birches in more exposed situations. The islands are covered with heather, except where peat-bogs and birch-woods occupy badly drained areas. The Arctic tundras and Alpine fjelds have no trees, but only perennial herbaceous plants, mosses, and lichens. The reindeer is the only animal of importance in the north.

The Norwegian forest industry is based on the natural renewal of the trees. Close-felling, common to most European lumbering districts, is not practised. Nevertheless, forest products furnish more than one-third of Norway's exports, as the logs are easily brought down to the coasts and all the timber-ports are free from ice. Most of the production is now in the south-east. During the World War



FIG. 107. A TYPICAL SWEDISH FOREST IN ÅNGERMANLAND

Note the large boulders of igneous rock left behind by the great ice-sheet. Heavy snowfall makes it possible to transport the trees cut during the winter over the rough ground to the banks of the streams, where they are stored in readiness for the spring floods.

By courtesy of the Swedish Travel Bureau

Photo by W. Wangstrom

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timber became the chief Norwegian export, but as prices have fallen since 1920 the export of lumber is now of less importance than that of wood-pulp, more than one-quarter of the bleached cellulose used in the world's artificial-silk industries being obtained from Norway.

Though only a very small area is suitable for cultivation one-third of the people of Norway live by agriculture. Barley has been known to ripen at 2500 feet above sea-level, but, owing to the short summers, with their lack of sunshine for ripening, less than half the arable area produces human food. The potato is the only crop in which Norway is self-supporting, though considerable quantities of oats and barley are grown. Cattle-raising is the most important branch of agriculture, the native breeds being good milk-producers. South of Trondheim there are at least a million cattle, and many of these are taken to the mountain pastures in spring when the snow melts. The *saeters*, or mountain out-farms, are sometimes fifty miles from the parent homestead in the valley, and during the two or three months that the cattle are in the mountains butter and cheese are made by the peasant-girls who accompany the cows. Early in September the cattle and the crops of mountain hay are brought down to the valleys. Co-operative dairies have been widely established, cheese being made at Trondheim and Oslo, while factories at Hamar and Kap prepare condensed milk for export. In Sweden six-tenths of the area is forested, and the timber and pulp industries are more important than in the case of Norway. Moreover, the area under crops is much greater, especially in the south. There is a great similarity in the agricultural operations of the two countries.

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Sweden extends through fourteen degrees of latitude, a distance equal to that between the south of Sweden and Corsica, and is almost half as large again as the United Kingdom. Being cut off from Atlantic influences by the great highland area of the Scandinavian plateau, its Bothnian coast is icebound for four or five months every year, and

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ice-breakers are needed as far south as Stockholm during the winter months. Both in climate and in outlook Sweden is continental rather than maritime, and its influence has been felt mainly in those lands which border the Baltic Sea.

Occupied by man since the close of the glacial period, it has nevertheless remained somewhat isolated, and has retained a racial purity which is uncommon in Western Europe. The earliest contribution which Sweden made to history followed the conversion of the Scandinavian peoples to Christianity, when raids were made into pagan Russia, large areas of Finland, Estonia, and Latvia being brought under Swedish rule. Trade, however, remained largely in the hands of Hanseatic merchants until the sixteenth century, when, as was also the case in England, its freedom from foreign attack enabled Sweden to develop into a nation under a strong king, who established a Protestant Church, broke the power of the clergy, and founded the fortunes of the Crown by appropriating Church property. The decay of the Hanseatic federation left Sweden the principal commercial and military Power in the Baltic region.

Throughout the seventeenth century Sweden entered into intimate relationship with the rest of Europe. This was reflected in the intellectual and artistic development of the Swedish Empire. New universities were established in Finland and Estonia, colonies were established overseas, and trade and industry were fostered by the State. Because of the relatively small area of arable land the reserves of manpower in Sweden were always small, and both the Baltic and American possessions had to be abandoned. By 1820 Sweden had become a nation of peasant-farmers and artisans, resolutely determined not to be involved in European wars. During the past century, though periods of industrial depression have led to considerable emigration, Sweden has spent its energies chiefly in the development of its agricultural and mineral resources, and has remained a convenient transit country between East and West. By remaining neutral during the World War it established its finances in a thoroughly sound position, and at the present time dominates the commerce of the new Baltic states.

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Economic Sub-regions

1. **South Sweden (Skåne)** is the only part of Sweden where the climate and soil are suitable for the production of wheat and sugar-beet. The rainfall (twenty to twenty-five inches) occurs chiefly in summer and autumn, and the temperature is higher than 60° F. for nearly four months. As the winters are short, both spring and winter grains can be grown, and grapes and peaches ripen in the open air. South Sweden is consequently the chief agricultural area in the country, no less than 60 per cent. of Skåne being under cultivation. Even here, however, dairy-farming is more important than the growing of cereals. As in the other Baltic countries, peasant proprietorship is common, and many of the farms have land on the hills as well as in the valleys. In summer the cattle are driven to the hills and tended by girls, while the men cut timber. The women who are left at the lowland farms are responsible for looking after the crops. As the frost season is relatively short, the work of the farms can be spread over the greater part of the year, and fewer seasonal labourers are needed than farther north, where the growing season is shorter.

Malmö (119,000 inhabitants), which commands the southern entrance to the Sound, is the principal agricultural market and manufacturing centre of Southern Sweden. The development of a free harbour and train-ferry services to Denmark, and through Trälleborg to Germany, has caused a fourfold increase in its population since 1880. The old Danish fortress of Hålsingborg, opposite Helsingör, is the chief centre of the Swedish rubber industry, and shares in the trade and textile and agricultural machine industries of Malmö. The island of Gotland was the great *entrepôt* of Baltic trade during the twelfth and thirteenth centuries, but with the rise of Lübeck, and later of Copenhagen, its port, Visby, has fallen into picturesque decay, the medieval ruins attracting summer tourists.

2. The **Småland plateau** is a thinly populated district of forests and hill-pastures. The power derived from its rivers is used in the timber, paper, engineering, and textile indus-

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tries of the district near Lake Vätter, and especially in Jönköping (30,000 inhabitants), the original centre of the safety-match industry.

3. The **lowlands of Central Sweden** have four months of warm weather in summer, but as much of the rain falls at this season the principal grain is oats, and most of the arable area is under fodder crops. Arable clay plains occupy one-third of the surface of Central Sweden. The farms average about 250 acres in extent, but fully a quarter of the arable area is divided into holdings of less than twenty-five acres.

As in the other Baltic countries which have a large number of peasant holdings, hay and roots are the principal crops, though no less than 40 per cent. of the value of farm products is due to grains, oats and mixed grains being sown as fodder crops. The chief single food crop is potatoes, though roots used as cattle fodder occupy a much larger area.

Until about 1850 Sweden produced a surplus of wheat for export, but, as in Denmark, the fall in wheat prices caused the crop to decline in importance. Nevertheless, at the present time only 4 per cent. of the total value of Sweden's imports consists of wheat, and the harvest can always be increased if world-prices are high. Thus, the output of 1921 was 25 per cent. greater than that of 1913, and 100 per cent. greater than that of 1924. In all other food and fodder crops Sweden is practically self-supporting, though sugar-beet is confined to the extreme south.

The most important agricultural industry is the rearing of livestock, cattle being bred for both milk and meat, and pigs for bacon. British varieties of sheep are kept for both mutton and wool. Much of the dairy produce, meat, and eggs is consumed in Sweden, but the export of butter is important and the number of co-operative dairies is increasing. With cheap power, good communications, and easy access to the mineral deposits of Värmland and Dalarna, Central Sweden is a highly industrialized region. Wood is the most important of Sweden's natural fuels, for the coal of Skåne and the alum-shales of Västergötland and Närke

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are of small industrial importance. Considerable use is made of waste timber and sawdust in the charcoal and pulp industries, but nearly 5,000,000 tons of coal have to be imported from Upper Silesia and Britain. Two million tons of coal are used for domestic fuel, 2,000,000 tons by the railways, steamships, and industrial works, while the remainder is used in gasworks and furnaces.



FIG. 108. RISTA FALLS, JAMTLAND

In the spring the trunks felled during the winter are floated down to points where the waterfalls supply power for converting the timber into planks.

By courtesy of the Swedish Travel Bureau

Photo by G. Heurlin

Hydro-electric and direct water-power are both used in the industrial works of Central Sweden, but as the annual precipitation is not abundant (sixteen to forty-eight inches per annum), the water-supply is irregular. As the local falls are small (ten to thirty feet), and the rapids extend over long distances, the construction of dams is costly, and power is often obtained from more easily developed hydro-electric power centres by means of long-distance transmission lines. It was for the purpose of overcoming the unequal distribu-

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tion of electrical power that the Trollhättan Falls were harnessed to produce 162,000 horse-power. More than half a million horse-power is derived from the Göta and the rivers which radiate from the Småland plateau. There are several other factors, however, which favour the development of hydro-electric power in Central Sweden. The character of the ground is suitable for secure foundations, there is an abundance of building stone, the lakes equalize the flow of water, while the run-off is comparatively great, and amounts to between 40 per cent. and 70 per cent. of the total precipitation. At first developed in connexion with the lumbering and pulp industries, hydro-electric power has now been applied to the provision of light and traction in most of the villages of Central and South Sweden. Nearly four-fifths of the power which can be utilized in an economic fashion has now been harnessed, and any great expansion of the manufactures of Central Sweden will necessitate the transmission of power from Norrland.

A further half-million horse-power is produced between Stockholm and Gävle, and this is used for the electrification of the railways, the lighting of towns, for the working of mines, ironworks, and machine-shops of Bergslagen, and for the pulp, paper, and chemical industries—*e.g.*, the dynamite-works at Gyttorp, near Stockholm. In this area the chief power-stations are situated along the Dal river, where a quarter of a million horse-power are developed at fifty power-stations, the chief of which, at Alfkarleö, near Gävle, produces 75,000 horse-power. Sweden is the most industrialized of the countries on the Baltic Sea, and the proportion of the population engaged in industry and mining has increased from 14 per cent. in 1870 to 40 per cent. in 1930 (*cf.* Germany). From 1910 onward the increased use of water-power has been largely responsible for the rapid development of industries, a development greatly stimulated during the War period. Many of the industries have been developed to meet the demands of the home markets, and these are fostered by protective tariffs.

Textile manufactures originated in the widespread handloom industries, but these gradually declined before the

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general introduction of power machinery about the middle of the nineteenth century. The Continental embargo of 1806 brought success to the first cotton-mill, and the second, which was erected at Sjötorp in 1813, south of Trollhättan, is still running. Cottons were produced on hand-loom in the so-called 'pedlars' district' of Älvsborg, near Göteborg. A weaving mill was established in 1834 by Sven Erikson, who started life as a pedlar, selling the cloth made by his mother. By the middle of the nineteenth century he had developed a home-weaving industry, with cotton-mills at Rydboholm and Viskafors. This district is still the chief cotton district, the market centre being Borås. Modern linen-manufacturing began about the same time near Göteborg, and is maintained by imported supplies of flax. Jute cloth is made at the linen centres, especially at Halmstad. The woollen industry has also shown a tendency toward concentration in a few large-scale enterprises at Norrköping (61,000 inhabitants), Malmö, and Borås.

Since the close of the World War the output of the boot and shoe industry, which is concentrated at the west end of Lake Hjälmars, near Örebro, and at Stockholm, has exceeded domestic needs, and there is a small export. Both the textile and the leather industries employ women, while the men find work in the mining, metal, and timber industries.

It is to its mineral deposits, however, that Central Sweden owed its early industrial development. The southern edges of the Archæan plateau of Värmland, Västermanland, Dalarna, and the Bergslagen possess metalliferous ores, and since the thirteenth century have formed the training-ground for a people who have become masters of the technique of metal-working. The deposits of copper, lead, silver, and zinc are nearly exhausted, but large quantities of accessible iron are still mined. The old "Iron Belt" of Bergslagen stretches from Upland to Lake Vättern. For centuries the occurrence together of woodlands, waterfalls, and iron ore was responsible for the smelting of iron, formerly Sweden's most famous industry. The ore is found quite close to the surface, and is generally worked in quarries (*cf.* the United States). During the early Iron Age the inhabitants learned

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how to smelt the valuable metal from lake and bog ores. In the Middle Ages Central Sweden was dotted with the primitive hearths where the famous "Osmund Iron" was forged.

The ores of Central Sweden are of good quality (52-55 per cent. metal), the Dannemora ores being among the finest in the world. The absence of phosphorus led to the rapid development of iron manufactures during the seventeenth century, and for a time Sweden became the foremost iron-exporting country in the world, nearly two-fifths of the world's supply being produced in its forges. Even now the iron

ores of Central Sweden are far

from being worked out, and the finest qualities of iron and steel are still produced there.

The output of pig-iron and steel has declined during recent years because Sweden has no coal suitable for conversion into blast-furnace coke, and only the most valuable kinds of charcoal steel and wrought iron can compete in the world-market with the products of coke-producing countries. The

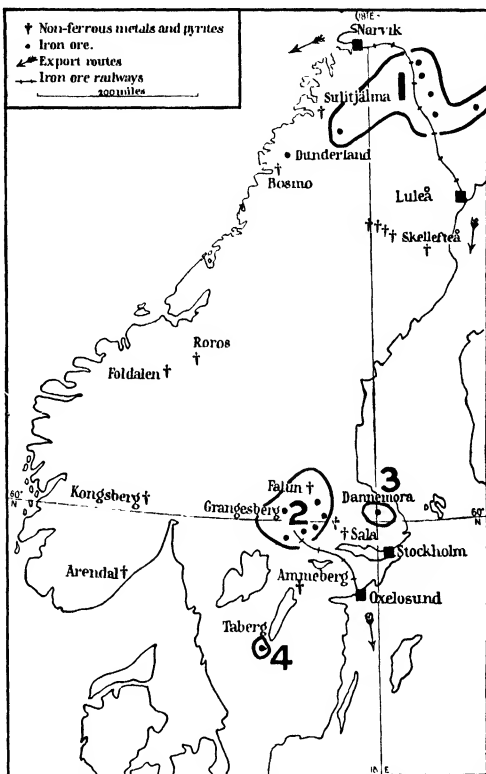


FIG. 109. ORE DEPOSITS OF SCANDINAVIA

1, northern ironfield; 2, Grangesberg and Bergslagen deposits; 3, Dannemora ironfield; 4, Taberg ironfield.

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pure ores obtained from Dannemora, Persberg, and Bipsberg are used for the production of Swedish steels, but the phosphoric ores of the Grangesberg district, which are mined at greater depths, are exported to Germany, Britain, and Poland. The railway from Grangesberg to Västerås and Oxelösund, the iron-port, has been electrified. In 1918 Central Sweden produced 2,500,000 tons of ore, but the present average is not more than 1,500,000 tons, chiefly high-grade phosphoric ore produced in Grangesberg for export.

The reasons for the superior qualities of Swedish steel are the purity of the ores, which are easily concentrated by the use of electromagnets, the high standard of skill of the workmen, and the technique which enables the steel-works to comply with the exacting demands of the Swedish engineering industries. During the nineteenth century the competition of cheaper varieties produced in Germany and Britain forced Sweden to produce a very high quality of steel, which is used in the manufacture of cutlery and ball-bearings. The iron and steel industry is entirely confined to Central Sweden and to the immediate neighbourhood of raw material and water-power. About 750,000 tons of raw steel are produced annually, a comparatively large part in small works. The steel-yards at Falun, Söderfors, Gävle, Bofors, and Trollhättan supply the engineering-works of Stockholm, Eskilstuna, Västerås, Köping, and Göteborg, where electrical and agricultural machinery, tools for sawmilling and paper-making, and internal-combustion engines are produced for the world-market. In certain kinds of machinery standardization and specialization have given to Sweden a commanding position. Cream-separators, water-turbines, farm tractors, woodworking and mining machinery, ball-bearings, and cables are the chief products. Eskilstuna (32,000 inhabitants), the great centre of metal and machine industries, produces cutlery, and Stockholm Primus stoves, while at Hagfors, as in England, the manufacture of screws has developed from an earlier woodworking industry.

From time to time little commercial settlements were built at the mouth of the Göta river, only to be destroyed by the Danes, and it was not until the seventeenth century,

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when Sweden obtained access to the Skager Rak, that Göteborg (241,000 inhabitants), near the fortress of Bohus, became commercially important. This port enabled Sweden to enter the Atlantic and East Indian trade. Göteborg's *entrepôt* trade increased with the development of world-wide shipping services, nearly half the external trade being carried in Swedish ships. Except in the Baltic trade, Göteborg carries on the greater part of Sweden's foreign commerce. Its chief imports consist of coal, grain, textile materials, and tropical and sub-tropical colonial products, especially coffee and fruits. Its principal exports are wood-pulp, timber, metal goods, and dairy produce.

During the thirteenth century the islands at the narrow mouth of Lake Mälär were fortified to guard the eastern entrance of Central Sweden and the old capital, Uppsala. With the unification of the Swedish states during the sixteenth and seventeenth centuries Stockholm (486,000 inhabitants), at the geographical centre of Sweden's Baltic territories, which included Finland and Latvia, became the capital. The entrance of the sea-channel is guarded by the fortified island of Vaxholm, and as the passage through the rocky islets with which the east coast of Sweden is studded is impossible to any but a skilled pilot Stockholm is absolutely impregnable to naval attack. As a collecting and distributing centre, the port is matchless, and large vessels can lie along the quays in perfect safety, while there is water communication with all the valleys which enter Lake Mälär. While sharing to some extent in the timber, textile, and engineering trades, Stockholm is chiefly important as the principal Baltic port of Sweden, while the islands of its gulf provide an almost unique residential and tourist district. To the west, in Lake Mälär, is a second archipelago, occupied chiefly by island farmers.

4. The ancient plateau of Northern Sweden consists of Archæan and Primary rocks covered here and there with glacial gravels. Along the shoreline of the Gulf of Bothnia is a strip of coastal alluvium, recently raised above sea-level. These alluvial plains give continuous land communication along the coast between Central Sweden and Finland. Except

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on the coast, neither soil nor climate is suitable for agriculture. The growing season is short, and winter conditions continue for more than half of the year. Many small towns, mainly at river-mouths, are the principal settlements.

In the extreme north, in Lapland, most of the higher ground is snowclad throughout the year, though the total annual precipitation seldom exceeds eighteen inches. There is less than two months of warm weather, and the vegetation of the northern districts is consequently of the tundra type, the chief human occupation outside the mining districts being the keeping of reindeer. Throughout Northern Sweden the rainfall occurs chiefly in summer and autumn, with partial drought in spring, when the strong east winds check vegetative growth. In summer the sunlight is almost continuous, but as the surface is largely composed of barren rocks less than 5 per cent. of Northern Sweden is under cultivation.

Though useless for agriculture, the northern plateau contains two-thirds of Sweden's forest-land. Unfortunately, unlike the south, where a more favourable climate, better soils, and denser population encourage a greater development of timber industries, the trees of the north take more than a century to reach maturity. In the south a great part of the timber cut is used locally and in the great wood industries, but in the north there is no local market, and the greater part of the lumber is converted into planks and exported during the summer months, when the northern ports are free from ice.

Sweden is peculiarly suited to the production and export of timber. Lumbering depends very largely on climate. There must be hard snow in winter to facilitate the transport of the logs to the rivers. The snow and ice must melt in spring in order that the rivers may become deep enough to carry the timber down to the sawmills. Since these Swedish rivers have a moderate gradient, and as there is a heavy snowfall, spring is marked by a high-water level that is prolonged by the late melting of the snow in the mountains. Numerous lakes regulate the flow and prevent serious flooding. The snow and ice melt first at the river-mouths, and

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gradually, as the temperature rises, the high water extends farther and farther upstream. This means that the work of floating timber is spread out over several months and minimizes the demand on the labour-supply, a great advantage in the scantily populated districts of Northern Sweden. There are floating channels every five or six miles, and it is estimated that timber never has to be carried more than four miles to a river. The average distance of overland transport is generally much less. Thus the cost of transport to the coast is low. Until recently, by cutting more than the annual growth, Sweden had the largest timber trade in Europe.

Three forest regions may be distinguished—the virgin forests of the north of the Gulf of Bothnia, the industrial forest of the southern districts of Northern Sweden, and the cultivated forest of South Sweden. As the growth of the northern forests is too slow for present-day economic development it is from the forests of South Norrland and Dalarna that the bulk of Sweden's timber exports (3,500,000 tons) is derived. In the past, however, the small timber has been left, and it was only with the advent of the big timber companies, who hold half the industrial forests, that the trees were systematically thinned out. Because of the large amount of small timber, the sawmills have found it necessary to add the manufacture of wood-pulp to their ordinary activities.

Above the narrow coastal plain Norrland rises evenly from the Gulf of Bothnia to the Norwegian frontier. The low forested Archæan plateau is broken by shallow depressions occupied by small lakes and bogs. In the valleys loose material has collected to such an extent that many of the rivers are obstructed by powerful rapids which form the chief reserve of water-power in Sweden. In early days the sawmills were situated at the waterfalls, but with the advent of steam-power, utilizing wood waste, the mills were removed to the mouths of the rivers, thus eliminating the costly transport of sawn timber. The sawmill industry is chiefly located at the mouths of the Norrland rivers, at Gävle (39,000 inhabitants), Söderhamn (11,000 inhabitants), Sundsvall

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(18,000 inhabitants), Härnösand (12,000 inhabitants), Umeå, Luleå, and Haparanda, the frontier station with Finland.

This region produces 70 per cent. of the total output of sawn goods. Lumbering is carried on during the winter, and cutting and planing in the spring. The season's output is exported between May and November. In the north the sawmill and pulp industries are intimately connected, but in Central Sweden the sawmills are generally carried on in connexion with the iron and furniture and paper industries, the thinnings being exported as pitprops. A very large part of the world's wood-pulp originates in Sweden, nearly 1,500,000 tons being exported annually. The pulp industry of Sweden differs from that of Canada and Norway in its production of chemical pulp, more than half the world's supply coming from Swedish works. This industry is the source of profitable by-products, such as alcohol, resin, and turpentine, whereas the mechanical pulp is used chiefly in the production of poor qualities of newsprint. Though of little importance in forestry and agriculture, the northern part of the North Swedish plateau is rich in iron ore, the reserves being estimated at about 1,150,000,000 tons, nearly ten times as great as those of Central Sweden, or one-tenth of the total iron reserves of Europe. The iron ores of Swedish Lapland sometimes contain as much as 60-70 per cent. of iron, but also $2\frac{1}{2}$ per cent. of phosphorus. They are much used in the basic furnaces of Britain and Germany. As there is only one district, Tuolluvara, where the phosphorus content is low, the ore is not suitable for the Swedish furnaces, and, as is the case of Grangesberg, the bulk of the output of North Sweden is exported. The only centres at present developed are the iron mountains of Gällivara and Kiruna-vaara, and though these deposits have been known since the seventeenth century it was not until the Riksgräns railway was opened that it was possible to begin to work the mines on a large scale. This railway, which is now operated from the Porjus power-station, on the Lule river, connects Luleå, on the Gulf of Bothnia, with Narvik, on the coast of Norway, and thus enables the export trade to be maintained in winter. Narvik, being an Atlantic port, never freezes, while Luleå is

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closed by ice from November to May. The annual output of iron ore in Sweden is normally between 6,500,000 and

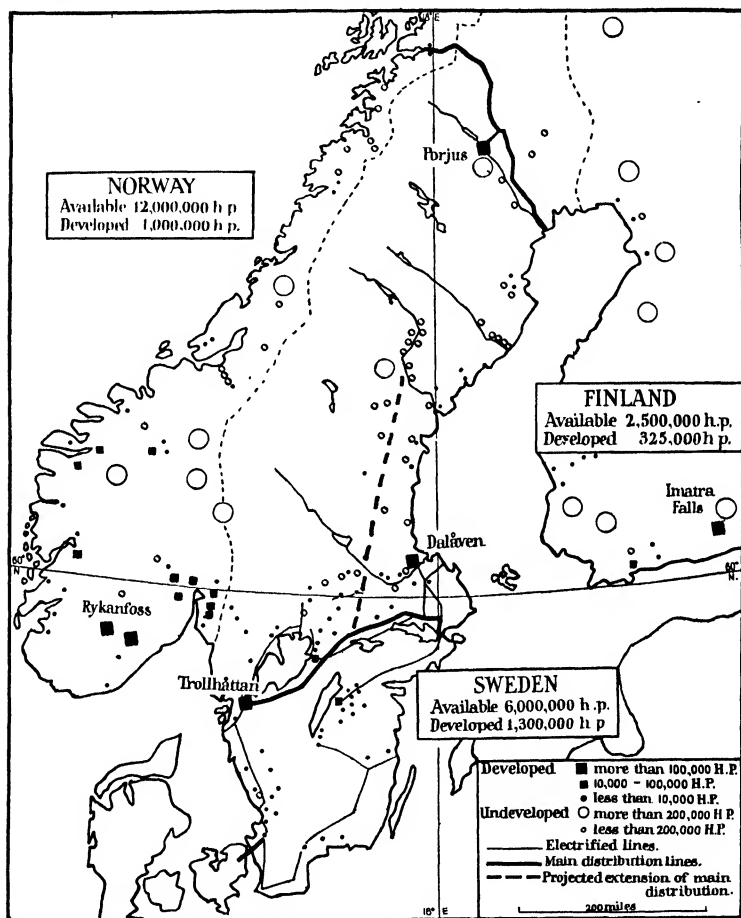


FIG. 110. HYDRO-ELECTRIC POWER IN SCANDINAVIA AND FINLAND

Norway has its power concentrated in a few places near the coast, four-fifths being produced in a quarter of its power-stations. Swedish power is widely distributed, and most of Sweden's largest falls are a long way from the places where the power is needed.

7,500,000 tons. Nine-tenths of this amount is exported, more than three-quarters of the exports being from Lapland.

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During the earlier phases of Sweden's industrial development mechanical power was produced from either timber or direct water-power. In fact, at the present day no less than 15 per cent. of the water-power used in industry is obtained as direct power. In her rivers Sweden could easily develop between 4,000,000 and 6,000,000 electrical horse-power. Up to the present time only 1,300,000 horse-power have been harnessed, because some of the greatest falls, such as the Harsprånger Fall, in Lapland (250,000 horse-power), are not situated in the districts where the power is needed. (For the Trollhättan Falls see page 541.) It is estimated that between 75 and 80 per cent. of Sweden's available water-power is to be found in the north, whereas the chief industrial works are in the centre and south. The only large power-station is the Porjus works, on the Lule river (80,000 horse-power). There is a number of small stations on the Indal, Skellefteå, and Ångerman rivers, but the difficulty of finding a market for the power has hitherto prevented the completion of a main transmission line between the Ångerman valley and the existing trunk-line between Trollhättan and Västerås, in Central Sweden.

The Present Economic Position

With less than one-tenth of its area under cultivation, agriculture is still the greatest industry of Sweden, which produces four-fifths of the food it consumes. Though a number of Finns and Walloons have settled in the country, the latter chiefly in the mining districts, the people of Sweden are chiefly of the Nordic type, and there has been no great influx of foreign immigrants to swell the population of the industrial districts. Being far from the main routes of world-trade, and from the chief markets and population centres of Europe, Sweden's industrial development has been less rapid than that of the North Sea countries, and more than four-fifths of its exports consist of iron ore and timber, while a further 12 per cent. consists of semi-manufactured goods—*e.g.*, wood-pulp—and not more than 5 per cent. of fully manufactured goods. Nevertheless, the rapid development of its industries

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during recent years makes Sweden part of the industrial region of North-west Europe, rather than of the Polish and Baltic transitional region. It should be noted that its annual rate of emigration (1 per 600 inhabitants), which is mainly to the United States, is considerably less than those of other Baltic countries. This is because industrial life is developing more rapidly, nearly one-fifth of the total population being engaged in manufacturing. It is certain that from being practically self-supporting Sweden will become a highly industrialized country, dependent on other lands for its food-supplies and for the marketing of its finished manufactures. Already the value of the manufactured goods exported is high, and metal goods alone account for about one-sixth of the total value of its exports. No less than 35 per cent. of the workmen of Sweden are producing goods for the export market.

Iron ore is the principal single export, and is chiefly dispatched during the winter half-year from Narvik (2,500,000 tons), during the summer from Luleå (2,500,000 tons), and throughout the year from Oxelösund (2,000,000 tons). Lumber and sawn timber, pulp, and matches are exported mainly from the east coast ports, and paper is exported from Stockholm and Göteborg. Small quantities of dairy produce and leather are also exported from Malmö. Bulk cargoes of coal, petroleum, wheat, and oil-cake are imported through Göteborg, but the most valuable imports are textile materials and clothing. Before 1914 one-third of the imports came from Germany and one-quarter from Britain, while goods of approximately equal value went to each of those countries. The United States provided one-tenth of the imports. During the World War Sweden suffered heavily from the trade blockade and the submarine campaign, so that during the winter of 1917-18 there was an acute food shortage, though both trade and industry were flourishing and the value of Swedish currency was high.

As a result of the stimulus which the War gave to the export industries Sweden was the first European country to return to the gold standard, and its economic position at the present time is excellent. After the World War one-quarter

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of Sweden's foreign trade was with Britain, Germany's share fell to 18 per cent., while that of the United States increased to 14 per cent. No less than 8 per cent. of Sweden's foreign trade passes through Copenhagen, the *entrepôt* port of the Baltic.

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Norway comprises the western and northern parts of Scandinavia, and recently the Svalbard archipelago, which includes Spitsbergen and Bear Island, has been added to Norway's territory. The mainland stretches from about 58° N. to 71° N., a distance of 1100 miles. The shoreline, however, is much indented, so that the total length of coastline is about 12,000 miles, a fact of the greatest importance in the development of Norwegian life. Since the Early Iron Age men have made their homes wherever patches of fertile soil occur along the coasts, but the settlements have always been small, and not highly prosperous, and it has therefore been necessary to supplement husbandry with fishing. Whenever a settlement has outgrown local resources the younger folk have broken away to found new homes elsewhere.

At first political power was based on the elective rights of free peasant communities, but gradually the freeholders became tenants, the nobility sank into the peasant class during the periods of union with Sweden and Denmark, and shipping was taken over by the Hanseatic League.

The reason for the decline of Norway during the Middle Ages was its isolation. After the Black Death (1349-50), which greatly reduced their numbers, the Norwegians lost all knowledge of political administration, and the ships they built for local traffic were not modernized, but were based on those of the vikings—a type which could not compete with those of the Hanseatic federation. However, in spite of its intimate union with Denmark from the fourteenth to the nineteenth century Norway retained its own laws, and there are few countries where individual freedom is so highly prized. Throughout the nineteenth century, during the

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latest period of union with Sweden, there was a remarkable revival of the old Norwegian language. In the west, where national consciousness is strong, several towns, including the capital, have been renamed since Norway became an independent kingdom. Everywhere the cultural level is high, and the English language is understood by a larger part of the people than in any other European country outside the British Isles. During the present century Norway has become somewhat less dependent on fishing, farming, and forestry than of old. Great hydro-electric industries have brought the country into line with the older industrialized countries. Tourist traffic is being developed on a commercial scale, and there are many other ways in which the organization of society on the basis of self-supporting family groups is being weakened.

Fisheries

Though fishing is no longer the chief export industry it is of vital importance as a source of food, and the exports account for one-tenth of the national income. The Norwegian fisheries are more than ten times as valuable as those of Denmark and compare in magnitude with those of Britain. The coast of Norway slopes very steeply down to depths of from 100 to 600 fathoms, and flat fish, which inhabit low, sandy coasts, are therefore absent, and only a few deep-water kinds, such as the halibut, are found. Round fish, however, are caught throughout the year in the neighbourhood of the coasts and islands, being most numerous in early spring, when spawning takes place, and also in autumn, when drifting organisms, plankton, are abundant near the coast. In consequence, the kinds of fish caught vary greatly.

Coastal Fisheries. Most of the food fish of Norway belong to the cod family, especially in the north, but flounders, herrings, and lobsters are also landed. Fishing takes place from the mouths of the fjords and on the coast banks, especially off Romsdal and Vesteraalen. The daily fisheries supply the coastal population with food. In Oslo Fjord conditions are favourable for the development of molluscs,

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of which the mussel is most important. In other districts large crabs and lobsters are found. The largest fisheries, however, are seasonal, and more than 500,000 tons of cod and herring are landed every year.

The channels between the numerous islands allow navigation by small fishing-boats to a greater extent than in any other part of the North Sea. Lines are still the most impor-

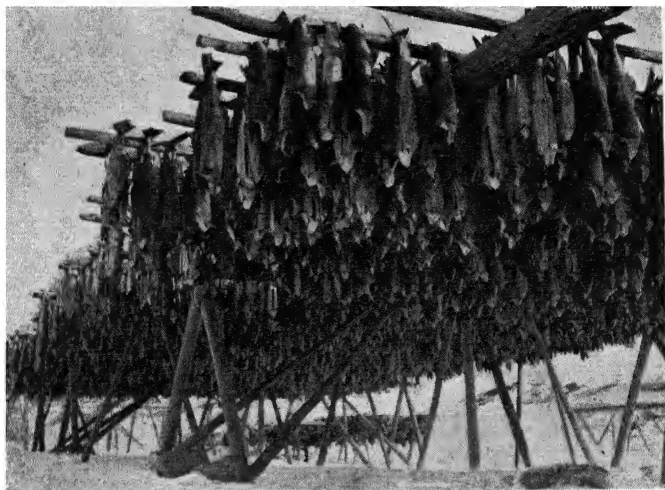


FIG. III. FISH DRYING FOR EXPORT, NORWAY

Stockfish must be hung on the scaffolds before April 12 and not taken down before June 12. The chief centres for the preparation of stockfish are Bergen, Tromsø, Trondheim, and the ports of Finmark.

By courtesy of the Norwegian State Railways

Photo by E. Wilse

tant part of fishing-gear, but for herrings seine-nets buoyed with cork, glass bulbs, and kegs, and anchored to the bottom by stones and grapnel, are much used. The shutting in of the herrings requires great skill, and the master-seiners are men chosen for their long experience. A lead is sometimes employed to judge the herring density of the shoals. Though fishing has been carried on for thousands of years, and though poor seasons occur, the fish arrive with almost unfailing regularity.

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The most important fish caught is the cod, which is believed to live generally on the great ocean banks, except when it approaches the shore to spawn, from January to April, and again later in the year, when it returns in search of food, driving huge shoals of smaller fish before it. Among the fish the cod pursues the so-called capelan is most important. The chief centres of the early spring or winter cod-fisheries are Romsdal, Tromsø, and, above all, the Lofoten Islands. Here 40,000 men gather during February and March. Some of the fish is landed at temporary warehouses which contain salting- and storing-rooms, but the greater part is taken by merchant vessels, which come in large numbers to the islands in early spring.

The cod is prepared as 'klipfisk' (salted and dried) or as 'torfisk' (dried stockfish), the heads and entrails being removed for the manufacture of cod-liver oil, manures, and train oil, an important illuminant during the long winter nights of the North. The 'torfisk' is dried on wooden frames and exported from Bergen, Trondheim, Tromsø, and the coast towns of Finmark. Italy takes about one-third of the stockfish, and smaller quantities go to Holland, Belgium, Germany, Sweden, and Africa. The salted 'klipfisk' is exported from Bergen, Kristiansund, and Aalesund to Spain and Portugal (60 per cent.), and to the Baltic, Britain, Cuba, and Australia. Of the by-products liver oil is important, while the roes are salted for export to France for use as bait in the sardine fisheries.

Herrings are next to cod in importance, but frequent the Norwegian shores for shorter periods. In the north large herrings are caught off Tromsø, Nordland, and Romsdal in November and December, but the brisling generally arrive off the west coast in spring, the most important centres being Haugesund and Stavanger, where the smaller fish are canned in olive oil or made into fish oil. The sild, or Norwegian 'sardine,' is a small herring.

Deep-sea Fisheries. Cod, coalfish, and haddock are taken on the ocean slopes of the submarine banks, but the North Sea, Farøe, and Iceland fisheries are less important than those of the coastal waters. They are carried on, however,

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throughout the year, and a large proportion of the catch is exported. The Arctic fisheries between Greenland and the Murman coast are more important, seals being taken in the spring. During the summer the bottlenose whale is taken in the same locality. In the eastern waters, between Spitsbergen and the Murman coast, these fisheries are carried on from Tromsø and Hammerfest. The headquarters of the whalers are at Sandefjord and Tönsberg, but whaling is chiefly carried on in the South Atlantic and the Ross Sea of the Antarctic. The South Shetlands now produce 400,000 barrels and South Georgia about 150,000 barrels of whale products annually. The whale-fishery is highly industrialized, land and floating boileries being used for the extraction of oil. More than half of the world's whale-fisheries are in the hands of Norwegian sailors.

Economic Sub-regions

1. **The West Coast.** This is the land of fjords, broken every few miles by long, narrow inlets stretching far inland; in the case of Sogne Fjord more than 130 miles. Fjords are U-shaped troughs which show every evidence of having been hollowed out by powerful glaciers along former river valleys. Soundings show that the floor of a fjord sinks slowly toward its mouth, where a submarine bank separates the inlet from the open sea. From Stavanger to the north a chain of islands, 150,000 in number, acts as a breakwater which protects coastal navigation from the storms of the open sea. The west coast consequently possesses easy communications. Though highly indented and rocky there are a large number of places where cultivation on a small scale is possible. The scattered farms occupy raised terraces of beach material on the so-called 'strandflat,' a rocky platform due to a former sea-level. As the rainfall is heavy the chief crop is hay, and the air is often so damp that special fences have to be built on which the hay can be dried for winter storage. The only continuous area of farmland is on the clay terraces round Trondheim Fjord, and it was here that the Norwegians first established their capital, Nidaros, or Trondheim (55,000 in-

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habitants), but even here it has always been necessary to combine fishing with farming.

In early times Norwegian overseas trade was confined to the summer months. Its use throughout the year by Lübeck merchants during the Middle Ages made Bergen (96,000 inhabitants) the chief centre of Norway's overseas trade, as it has remained ever since. It should be noted, however, that its tonnage is less than that of Oslo, which employs a larger number of coasting vessels. Neither fishing nor farming is carried on continuously in the same place. When the snow of the uplands melts in spring the cattle, sheep, and goats which have lived in the sheltered valleys during the winter are taken to the wind-swept pastures of the plateaux. There is also a seasonal migration of the fishing fleets, but because of the development of new manufacturing industries there is less dependence on summer pasturing and fishing, and the population tends to concentrate in small manufacturing villages, of which Odde, on Sör Fjord, the first centre to manufacture nitrates from the air, is typical.

Life on the islands is chiefly dependent on the fisheries, and on many parts of the coast daily fishing by lines from small boats is necessary to keep the coastal population alive. The coast folk, however, take little part in the regular North Sea fisheries, but confine their chief efforts to seasonal fisheries for cod and herring. These fish are salted or dried for export, both in the Lofoten Islands and at Trondheim, Bergen, Aalesund, and Stavanger (44,000 inhabitants), the latter being the chief centre of the fish-canning industry. The northern herring fisheries use the ports of Tromsø (10,000 inhabitants), the centre of Spitsbergen hunting and fishing. Hammerfest (3500 inhabitants), the most northerly town in Europe, is the centre of the Barents sea-fisheries, and shares in the whaling and sealing industries of Tromsø.

Narvik (7000 inhabitants), near the Lofoten Islands, has grown solely through the export of Swedish iron ore *via* the Lapland railway from the Gällivara mines.

2. The Norwegian Plateau. Nine-tenths of Norway lies above the 1000-foot contour, and three-quarters of the surface of the uplands consists of bare rocks, snowfields, and

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glaciers, with occasional stretches of Alpine moorland. Forests occupy one-fifth of Norway, but except in the south-east, where they reach a height of 2600 feet, they are confined to the deep, sheltered valleys of the coast. In the extreme north the Finmark plateau lies below 3000 feet, but gradually rises to the south, where the Sulitjälma district produces copper. Considerable areas are covered with perpetual snow, and there are a number of plateau glaciers, which in places nearly reach sea-level. Except for a few Lapps the Finmark plateau is uninhabited, practically all the people living on the coast. There are important iron pyrites mines at Kirkenes and Sydvaranger, on Varanger Fjord.

The Trondheim plateau lies at an average elevation of 2000 feet, and behind the Trondheim plain the highland has been faulted down, forming a semicircular depression of Cambrian and Silurian rocks which contain important copper deposits at Röros. The Guldal and Glommen valleys give a relatively easy land-route, which is followed by the railway from Trondheim to Oslo.

The Central Mountains lie to the south of Trondheim. As in the case of the more northerly areas, a plateau of Lower Primary rocks (5000 feet) overlies the Archæan platform, but the highest points, which rise to well above 8000 feet, are the igneous peaks of the Dovrefjeld, Jotunfjeld, and Hardangerfjeld. Here there are large permanent snowfields and a number of glaciers whose former extent may be gauged by the moraines deposited lower down the valleys. The Jostedalsbrae is the largest glacier in Europe (350 square miles), with an adjoining snowfield of nearly 600 square miles. The extensive Hardanger plateau lies to the south of the mountainous block of the Jotunfjeld, and contains a large number of glacial tarns and moraine lakes which form potential reservoirs for the development of hydro-electric power. Norway's greatest waterfall, the Rjukanfoss, produces nearly 300,000 horse-power, which is used in the manufacture of artificial nitrates, carbide, and aluminium. To the east of Telemark igneous rocks of Primary age break through the low Archæan plateau in the mining district of Kongsberg.

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Here are found the chief silver-mines of Norway, now of little importance because of the fall in the value of silver.

3. **The South-eastern Lowlands.** South-east Norway is a region of long parallel valleys, deeply intrenched in the plateau, which in this area lies at no great elevation. Toward their mouths the rivers have built up flood plains, which contain most of the farmland of Norway. The chief lowland areas are the densely wooded valleys of the Drammen and Glommen rivers. The principal tree is the pine, which extends up to 2600 feet, above which are birch-woods. The large forests, as a rule, lie far from inhabited districts, and a relatively large number of the timber-workers are young single men, who spend the autumn and winter months in felling and marking the logs which are floated down by timber-floating associations to the pulp-mills. The more remote mills of the Drammen produce mechanical pulp, while the district east of Oslo Fjord is specially important for chemical pulp, Sarpsborg (11,000 inhabitants) using power derived from the Glommen Falls. Fredrikstad (15,000 inhabitants) is the chief export port of pulp and timber, and the timber trade of the west of Oslo Fjord is shared also by Tönsberg (13,000 inhabitants), Larvik (11,000 inhabitants), Halden (Fredrikshald) (12,000 inhabitants), Drammen, and Sandefjord. There is iron-mining near Arendal (10,000 inhabitants) where smelting is now carried on in electric furnaces.

Less than one-eighth of the surface of Norway lies below the 500-foot contour, but in this area, and particularly in the country round Oslo Fjord, no less than two-thirds of the population is to be found. The Norwegians are essentially a coastal nation, and in a less degree a valley people. The great centre of land-routes is at the head of Oslo Fjord, where Oslo, formerly Kristiania (252,000 inhabitants), is the headquarters of national commerce. As it is the chief distributing centre, more than half the imports of Norway enter Oslo. The export trade is not concentrated in one port, and the capital has less than one-fifth of the export trade. Oslo is the chief centre of the textile, leather, ship-building, and engineering industries.

4. **The Svalbard Archipelago.** This group of Arctic islands,

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25,000 square miles in area, lies between latitude 77° N. and 80° N. Though it was probably known to the Vikings, the main island of Spitsbergen was discovered and claimed by the Dutch in 1596. The English also claimed it, and, after Hudson had reported the existence of whales, seals, and walrus on its coasts, it was visited by fleets from England, Denmark, Holland, and Norway. These vessels employed



FIG. 112. SKETCH MAP OF THE SPITSBERGEN COALFIELDS

Basque harpooners. After the bay fisheries had begun to decline Russian fur-trappers came from Archangel, but after the middle of the nineteenth century they ceased to winter there, and the Spitsbergen fur-trade fell into the hands of Hammerfest and Tromsø. During the present century hunting has been carried on to such an extent that there is a danger that the supplies of bear, fox, reindeer, and walrus will be exhausted, and Norway, whose sovereignty subject to the per-

manent demilitarization of the islands was acknowledged in 1925, has instituted game laws.

The islands are plateaux of between 2000 and 3000 feet in height, which dip gently toward the east. The west coasts, however, show the old Caledonian folds. The islands are dissected by fjords, at any rate in the west. Many of the valleys are still filled with ice, and in North-east Land there is a continuous ice-sheet covering all except a coastal fringe. It is probable that Western Spitsbergen was formerly continuous with Norway, but, unlike Norway, there are large areas of Carboniferous and later strata which are superimposed without appreciable folding in the centre and east. Coal occurs in the Permo-Carboniferous, Jurassic, and Ter-

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tiary rocks, and is mined chiefly in the district around Icefjord. The Cretaceous coal is poor; the Carboniferous coal is good, but is not yet worked. The Tertiary coal has a steam-raising quality nearly equal to that of the anthracite of South Wales. The seams are horizontal, and vary from three feet to ten feet in thickness, and as they are well above sea-level mining and loading offer few difficulties. High-grade iron ore has been found in Prince Charles Foreland, and there are valuable beds of gypsum, which occurs in enormous quantities.

Though the existence of coal in Spitsbergen has been known for several centuries, it was not until recently that coal has been mined. The absence of national ownership caused some difficulty in exploitation. During the World War an American mine at Longyear "City" was taken over by a Norwegian company. There are now only three mines actually working, though several others exist. The coal-shipping season is from May to October, and Norway, Sweden, and North Russia offer a ready market for Spitsbergen, but until the end of the War less than 80,000 tons were exported annually. In recent years the coal output has increased, and in 1929 amounted to 236,000 tons, all of which was obtained from the mines at Advent Bay and Kings Bay.

Industrial Development

The population of Norway increased from less than half a million in the seventeenth century to nearly a million a hundred years ago. Since that time the number of inhabitants has trebled. This is chiefly accounted for by the increased proportion—namely, one-quarter—engaged in industrial occupations. Hand-work industries, such as boat-building, still exist, but at the present day most of the industries are carried on in factories, and particularly in those which make use of hydro-electric power in producing semi-finished manufactures. Thus, the sawmilling industry of the Fredrikstad district has been extended to include the production of wood-pulp and paper, an industry in which Norway, despite its meagre timber reserves, takes a leading

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part. The country behind Drammen is one of the principal sources of mechanical pulp in the world. Recently there has been a great extension of the electro-chemical and electro-metallurgical industries, two-fifths of the power produced being consumed in the production of nitrogen products, carbide, and aluminium. Especially noteworthy is the production of sodium nitrate at Notodden. This, with other nitrogen fertilizers, is exported for use in the manufacture of dyes. There are other centres of hydro-electric industries in the Bergen, Stavanger, Søgne, and Kongsberg districts. Labour is relatively dear, while power is extremely cheap, so that present developments are confined to the manufacture of fertilizers, carbide, and metals such as aluminium in Sognefjord, the bauxite being imported direct from Marseilles. The new works at Rjukanfoss (which produce 300,000 horse-power) for the production of nitrates are typical of the scale on which electricity is now produced.

Norway possesses about 12,500,000 potential electrical horse-power, but up to the present only one-tenth of this has been developed. Any considerable increase of population will lead to the development of large-scale manufactures at the ice-free harbours, and already hydro-electric power is being used in the mines, in the flour-milling and textile industries of Oslo and Bergen, and in the engineering-works of Fredrikstad, Bergen, Trondheim, and Nyland (Oslo). The alternative to the development of manufactures is the export of electricity in bulk, and plans have already been drawn up for the export of electrical power to Denmark, and, if necessary, to Germany.

Communications and Trade

Modern Norwegian commerce dates from the close of the Napoleonic wars, from which the country emerged in a financially weak condition, but as an independent kingdom. At first the export of timber to Britain was restricted by high import duties designed to foster Britain's colonial timber trade, but with the great expansion of the industries of North-west Europe during the nineteenth century large

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quantities of timber and fish were sent to Britain and Holland. Norway succeeded in developing a large mercantile marine, and the profits of Norwegian shipping have become an important source of national income, so that foreign products, the value of which is considerably in excess of Norway's exports, can be obtained. A large proportion of the food-supplies is obtained from overseas, and large quantities of textiles and metal goods are also imported. Nearly one-third of the foreign trade is with Britain, and one-quarter with Germany. During the World War Norway's foreign trade was hampered by pressure from Britain, who wanted Norwegian timber, but refused to allow the import of raw materials needed by Germany.

As two-thirds of the population live on the coasts, and no less than one-seventh on the islands, a large proportion of Norway's internal trade is carried by water. The chief exports are timber and wood-pulp (35 per cent.), fish and fish products (25 per cent.), electro-chemical and electro-metallurgical products, manufactured foodstuffs—*e.g.*, meat, milk, and jam—and ships, while the imports consist chiefly of wheat, textile materials, coal, machinery, and colonial produce—*e.g.*, sugar and coffee.

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Danish independence depends largely on the conformation of Jutland being so nearly that of an island as to isolate it somewhat from the rest of the European plain. It is probable that at one time the islands of Fünen and Zealand formed part of the mainland, and that the sea broke through as it did in Holland, where the Zuider Zee was formed. The Great and Little Belts are shallow, like the Sound, which separates Denmark from Sweden. Physically Denmark is an outpost of the European plain, and the chalk which underlies the greater part of the mainland is almost everywhere hidden by more recent deposits, and especially by moraines, which form the low hills of Jutland, and by the boulder-clay of the islands. On the eastern coasts the chalk forms cliffs in places.

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In consequence of the greater ease with which its soils can be cultivated Denmark produces more grain than Norway and Sweden together, and it has always been the principal granary of the Scandinavian countries. In fact, though the Scandinavian peninsula occupies nearly eighteen times the area of Denmark less than one-tenth of its surface is under cultivation, whereas in Denmark nearly four-fifths of the surface produces crops. Its wheat crop alone is equal in quantity to the total grain output of Sweden. It was not only the most fertile of the Northern countries, but it also controlled the sea-route between North-eastern and Western Europe throughout the Middle Ages, and at an early date engaged in a policy of overseas trade and conquest. Like Norway and Sweden, however, it was not sufficiently densely populated to maintain a stream of emigration indefinitely, and after the supreme effort of the conquest and settlement of parts of the English plain Denmark could no longer dominate the trade either of the Baltic or of the North Sea. At the present time Denmark is a highly specialized agricultural country supplying the industrialized parts of Western Europe with dairy produce. As a result the capacity of the country for population has greatly increased during the past fifty years, though emigration still takes place to a limited extent. At the present time Denmark has little share in world-affairs, and follows a policy of permanent neutrality. Unlike Holland and Switzerland, however, it is not a centre of great routes, and its international activities are mainly cultural.

Climate

The climate of Denmark is the most maritime climate of all the Baltic countries, and resembles that of Eastern England. The winters are cold and the summers relatively warm, but have much cloud. There is generally a frost-free season of 230-280 days. The annual rainfall varies between twenty-three inches and twenty-six inches, an amount suitable for wheat wherever the summer temperatures and sunshine permit. Even at the present day, when only 200,000 acres are under wheat, the yield per acre is higher than for any

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other grain. On the whole, however, the climate is more suitable for other grains, fodder crops and root crops being especially important. The ports of the Belts and Sound are subject to a little trouble from ice in winter, but the western coast of Jutland is always free from ice.

Denmark's Pastoral Industry

It was not the climate which, about fifty years ago, caused the Danish farmers to specialize in cattle-rearing. It was the rapid development of the wheatlands of America, which enabled foreign grain to be imported into Denmark at a lower price than that at which it could be produced locally, that expedited the change to pastoral farming. By not imposing duties on foreign grain Denmark was able to supplement its root crops by cheap imported cattle-foods, and thus to specialize in the production of milk and meat for export to the rapidly developing industrial regions of Britain and Germany. There is very little permanent pasture-land in Denmark, and only the moors of Jutland and the strip of land along the coasts of the inlets can be classed as permanent grazing-land. As a result sheep are seldom kept on Danish farms. Nearly four-fifths of the total land surface of Denmark is now arable, and 85 per cent. of this is actually under cultivation. This includes much land in the west reclaimed from moor. Intensive farming has gone further than in the other Baltic countries, and as it has been found that, weight for weight, roots are twice as valuable as hay for cattle-fattening the area under grass has been reduced. Roots form roughly 40 per cent. of the harvest, potatoes being grown both for human consumption and as fodder. Potatoes are also made into flour. The area under sugar-beet is nearly as large as that under wheat, and there is sometimes a surplus after Danish needs have been satisfied.

Cereals cover 40 per cent. of the arable land, and are grown principally for stock, barley and oats being frequently sown together. Three-quarters of the grain area is under oats, barley, and mixed grain, the remaining area producing sufficient rye and wheat for domestic needs, though these

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crops are used as food for stock as long as the price of imported wheat is low. Most of the wheat used for human consumption is imported through Copenhagen, where there are large flour-mills. Where power is available the mixed corn is crushed for pigs. Peas are grown and crushed for the horses, but very little hay (not more than 10 per cent. of the total harvest) is used. The first crop of lucerne is



FIG. 113. CATTLE TETHERED IN DENMARK

Landmanden Foto, by courtesy of the Danish Tourist Office

harvested, but as climatic conditions require that the cattle shall be kept indoors during the winter the chief winter food consists of roots, cake, chopped straw, and grain.

When converted (according to food value) into grain tons the grain crops amount to half of the harvest, roots to two-fifths, and hay to one-tenth. This is largely due to scientific improvement of the soil and to railway freightage in imported fertilizers being especially cheap. There is little waste land. Throughout Jutland there is hardly a hedge, and though fences are sometimes used to divide the farms an unploughed

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line of turf is often the only boundary. The cattle are not allowed to stray, and so trample down the grass or eat more than is strictly necessary. The farmers know exactly what quantities and proportions of fodder should be supplied to get the greatest quantity and finest quality of milk, and the cattle are given just what is needed, and no more. In the summer the cattle are watered in the fields, and the herds are tethered there, the pegs being moved several times during the day.

The Danes have thus carried their specialization to a far greater degree than any other country, with the result that milk production is the main feature of the country's economic life, the total output being nearly 4,000,000 tons. Eighty-eight per cent. of the milk is converted into butter (much foreign margarine being imported for domestic use), 4 per cent. is converted into cream, cheese, and condensed milk, and the rest, 8 per cent., is consumed as fresh milk in Denmark. Nearly three-fourths of the agricultural produce of Denmark is exported to the more densely populated industrial countries, so that Denmark's dependence on imported supplies is nearly as great as that of Britain. This dependence on foreign markets was illustrated during the War, when neither Germany nor Britain was able to supply the foodstuffs on which Danish dairy production depends.

Co-operation in Denmark

During the past century Denmark became a nation of small-holders, 97 per cent. of the area consisting of farms of less than 180 acres. Recently there has been a tendency toward the creation of smaller farms, and since 1919 it has been illegal to close any farm, and its incorporation in a larger farm has been forbidden. Not only are the holdings small, but more than 92 per cent. are owned by the farmers themselves. As three-fifths of Denmark's dairy exports are sent to Britain and one-fourth to Germany it is obvious that the modern dairy industry depends on the demand of highly industrialized areas, which cannot profitably produce sufficient milk locally. Coastal pastures produce fine qualities of

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milk, and for a very long time the North Sea coast-lands have been noted for their cattle, although in the case of Britain butter-supplies have had to be imported during the winter months since the middle of the nineteenth century. Until 1875 these supplies were heavily salted, and were obtained chiefly from Ireland, but after 1879, when the first centrifugal cream-separator was invented, it was gradually realized that in the long run the most profitable way in which a North-west European country could use its grassland was by the development of dairy industries on a large scale. The invention of the cream-separator made it possible to produce dairy products on a large scale in central creameries, and as the dairy-farmers did not possess large reserves of capital the best way of establishing large-scale dairy industries was by co-operative methods. Climatic conditions made certain countries more suitable than others for the development of dairy industries, especially where the summers, though hot enough, are too wet for wheat, and, though wet enough, are not sufficiently warm for maize to ripen. If such places have winters which are not too cold for open-air grazing, and if good transportation facilities can be developed, dairying is the most profitable kind of farming that can be carried on.

The end of the war of 1864 had left Denmark poor, and each year the production of corn, which formed one of the principal exports, was becoming less profitable because of the rapidly increasing supplies from America and Russia, and though the actual crisis which necessitated a complete change in Danish agriculture did not arise until the eighties Denmark was ready for the seeds of co-operation much earlier, and the first societies for the co-operative purchase of seeds and implements were in existence before 1870. Early in the eighties the first co-operative dairy was founded as an organization for both manufacture and sale. From 1885 arable dairying has been the basis of Danish agriculture, and no propaganda was needed to extend the co-operative organization. Thus, in 1895 a few dairymen with a joint stock of 300 cows formed an association and employed an expert cow-tester. To-day more than 90 per cent. of the farmers, owning about 86 per cent. of the dairy cows in

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the country, are members of the 1400 co-operative dairy societies which concern themselves not only with breeding good animals, testing milk, making butter, and slaughtering pigs, but with marketing the produce and purchasing fodder, fertilizers, machinery, and blood-stock, and there is now in existence an Agriculture Council representing all sections of Danish agriculture, and dealing not only with the Danish Government, but with other industries and with foreign countries.

Denmark does not possess ideal geographical conditions for dairy-farming, and the cattle have to be kept indoors during the greater part of the winter. This involves the importation of large quantities of cotton-seed cake from America, but has the advantage that large quantities of manure are easily collected for use on the land.

The co-operative dairy industries have been directly responsible for the improvement of the sandy, almost barren, soils of the cultivated districts of Jutland to such an extent that large quantities of roots and grain can now be produced on what was formerly barren heath. As a result of the development of co-operative dairies Denmark now supports twice as many cattle, four times as many poultry, and five times as many pigs as it did in 1885, and in the period 1876-1924 the grain crop has increased from 2,700,000 tons to 6,400,000 tons. Nevertheless, the only crop which shows an exportable surplus is barley. Sugar-beet is an extremely valuable crop, as it affords an opportunity for cleaning the land, while the pulp is used as fodder. As a rule the sugar crop is more than sufficient for Danish needs, and small quantities are sometimes exported.

Manufactures

As Denmark possesses no coal and little iron, there are no large industrial enterprises. Nevertheless, in practically every town there are foundries which produce castings for the manufacture of agricultural machinery. Bicycles and motor-cars are also made, both for home use and for export to Sweden and other countries. Most of Denmark's indus-

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tries, however, are in connexion with agriculture—*e.g.*, flour-milling, the preparation of dairy products, including margarine for export, sugar-refining, and tanning.

Textile manufactures have gradually developed out of the hand-loom industries of early times, and in several parts woollen cloth is still made from the farmer's wool for a definite charge (*cf.* Central Wales). The hosiery industry was for long ages established in the moorland sheep-farming districts of Jutland, but knitting and weaving as handicrafts are practically extinct at the present day because of the introduction of power machinery. Moreover, Denmark no longer produces sufficient wool to meet the demands of the cloth and hosiery manufactures. There are now a number of cotton and linen mills, and fishing-nets are also manufactured. Most of the industries, however, produce goods for domestic consumption, and mass-production methods are not usual. Hydro-electric power transmitted from South Sweden is used in the Danish islands, and there are terracotta and porcelain industries in and near Copenhagen.

Shipping

Fishing provides employment for about 17,000 persons (5 per cent. of the inhabitants), who are chiefly engaged in coastal fishing in small motor-boats. The herring and cod caught in the Kattegat and the Belts and Sound were formerly smoked and exported to Central Europe, but the state of the exchanges has had an unfavourable effect. Lymfjord produces oysters. There are also small seasonal fisheries off Iceland and Greenland. The relatively small development of the North Sea fisheries is due to the absence of good harbours on the west coast. Esbjerg (24,000 inhabitants), the principal fishing-port, has grown from a little group of farms since the railway from Esbjerg was opened in 1878. Denmark has the fourth largest merchant fleet in Europe (600,000 net register tons), two-thirds being engaged in tramp trade and one-third in regular services. In 1924 about 10,000,000 tons entered Denmark and 1,800,000 tons left, about half the total being carried in Danish ships—most of the agricul-

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tural exports and 60 per cent. of the English coal being carried in Danish steamers. From Esbjerg and Copenhagen Danish butter, bacon, and eggs are carried to Harwich, Goole, Grimsby, Newcastle, Leith, Hull, and London. The bacon is chiefly imported through Harwich, London, and Grimsby, the butter through Goole, Grimsby, Leith, and Newcastle, the eggs come mainly to London. About two-thirds of Denmark's export of dairy products come to Britain, while Germany takes chiefly livestock and meat.

Physical Regions

Except in the island of Bornholm no rocks older than the Cretaceous period appear at the surface, and the Cretaceous floor is largely covered by glacial deposits. Nevertheless, there is a considerable difference between the glacial deposits of the mainland and those of the islands.

1. **Jutland.** As the retreating ice sheet of the last great glaciation of Northern Europe remained for a long time stationary, the former position of the edge is marked by a succession of low morainic ridges which form the relatively barren heights of Jutland. These nowhere reach 600 feet above sea-level, though after passing through the moors of Mecklenburg, Pomerania, and East Prussia they attain heights of more than 1000 feet in Lithuania and North-east Poland.

The west of Jutland consists of low-lying, unfertile, sandy plains, through which at intervals appear a number of isolated hills of morainic matter. As on the North Sea coasts of Belgium, Holland, and Germany, the west coast of Denmark is fringed by a line of sand-dunes, which until a few years ago were blown inland by the prevailing winds. With the exception of Esbjerg there are no important towns on the west coast, but on the east Aalborg (43,000 inhabitants) commands the traffic of Lymfjord and is the centre of the cement industry based on the local outcrop of chalk, while Aarhus (76,000 inhabitants), the second town of Denmark, is the chief market of Jutland, and engages in the North Sea trade.

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2. **The Islands of Fünen, Öland, and Zealand.** These are covered almost entirely by fertile boulder-clay and partly by less fertile soils and gravels. In several places the chalk reaches the surface—*e.g.*, in the cliffs of Möen—being used in the cement and lime industries. The richest farmland is found in Fünen, where Odense (52,000 inhabitants) is the chief town.

The most important district is Zealand, a pleasant fertile island, gently undulating and containing a number of small lakes. At a point on the east coast where the Sound is only two and a half miles wide a small island, Amager, formed a natural breakwater, and the harbour between it and the mainland of Zealand was protected by the castle of Copenhagen. During the period when Denmark held what is now South Sweden this harbour was the only great Scandinavian port. It owed its unique importance as the great *entrepôt* of Scandinavian and Baltic trade to its command of the Sound. With the development of ocean traffic Copenhagen lost a great deal of its international importance to London, but the modern development of ocean cable and wireless communications has allowed it to regain a large share of the *entrepôt* trade of the Baltic. Both Norway and Denmark import machinery and other manufactured goods *via* Copenhagen, which also acts as the collecting centre of the dairy exports of the Baltic countries to Britain. A great deal of coastal shipping is centred in Copenhagen, and there are train-ferries *via* Helsingör to Sweden and *via* Gjedser to Germany. A great deal of Copenhagen's importance is due to its free harbour, and its transit trade is largely responsible for balancing the deficit caused by the excess of Danish imports over exports. Its population is now 587,000 inhabitants. A century ago only one-fifth of Denmark's population lived in towns, but recently there has been a marked migration into the towns, and especially into the capital, nearly half of whose inhabitants are immigrants from rural districts. Consequently manufactures have been commenced connected with engineering and the preparation of agricultural products for exports.

3. **Bornholm.** Geographically Bornholm forms part of the

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Swedish area, and consists of Lower Primary rocks similar to those of Öland and Gotland, near the Swedish coast. Its shores are high and treeless, large barren heaths occupying the centre, which rises to about 500 feet above sea-level. Agriculture and fishing are the mainstay of the island, though granite and kaolin are quarried for export to Copenhagen. Formerly the manufacture of wooden clocks and homespun linens were domestic industries. The importance of the island in the past was due to its command of the southern approaches of the Sound. At the present time it has a small summer resort centre at Sandvig.

4. **The Atlantic Islands.** The Danish overseas possessions of the present and past are the Farøe Islands, Iceland, and Greenland.

The *Farøe Islands* lie midway between Scotland and Iceland. They have about 23,000 inhabitants, who are engaged in fishing and in sheep-rearing. The influence of the North Atlantic Drift enables the cattle and sheep to remain out of doors throughout the year, while the length of summer daylight (twenty hours) enables barley to ripen in good years. Turnips and potatoes are also grown. The village of Thorshavn (2000 inhabitants) is the chief settlement. As in the case of Iceland, a large proportion of the foreign trade is carried on through Leith. A little coal exists in Süderoe, but the islanders are largely dependent on imported supplies and on driftwood.

Iceland (106,000 inhabitants) has been independent since 1918, but has the same king as Denmark. It has an area of 40,000 square miles, or about two and a half times that of Denmark, but little more than one-fifth is habitable. Glaciers cover more than one-tenth of the total area, and the greater part of the island is considerably above the level where cultivation is possible in that high latitude. Except for a few stunted birches there are no trees, and the inhabitants still gather driftwood on the south coast. Less than 8 per cent. of the area consists of lowland, and most of the remainder is uninhabitable, though on the outer fringes of the plateau sufficient grass grows for the summer grazing of sheep. It is only on the low narrow stretches of coastal

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lowland that human settlements are found. The people of the island depend chiefly on fishing, which is undertaken on a relatively large scale for cod, especially in the neighbourhood of Reykjavik and Isafjord. In those parts, where there is no coastal shelf, the people exist almost exclusively upon the catching of wildfowl—*e.g.*, at Hornströnder, near Cape North. Whaling for a time was of some importance on the north, but is now given up. In places where the coast strip widens out the people are able to breed sheep, but the only considerable areas of lowland are in the south and south-west. Iceland is still a volcanic region, and lavas cover large areas of the Tertiary plateau. Earthquake shocks are common, and when the occasional eruptions drop clouds of volcanic ash over inhabited districts the pastures are ruined and the sheep and cattle die—*e.g.*, in 1783 there was a terrible eruption which caused the death of four-fifths of the sheep and horses and of more than half of the cattle. The famine which ensued carried off 20 per cent. of the population. Sulphur is obtained from the volcanic districts. Intercommunication between the valleys is carried on by packhorse and by motor-car, but roads are few, and there are no railways. Steamers connect the various coastal villages with Reykjavik (26,000 inhabitants). The capital has woollen manufactures and trades with Scotland, Norway, Denmark, and Spain. Its chief exports are fish and fish oil (82 per cent.), salt mutton (6 per cent.), and wool (5 per cent.), and small quantities of eiderdown and butter. The imports consist of grain, cloth, sugar, coal, salt, and metal goods. Iceland's long period of isolation enabled it to develop its own literature and art to such a degree that in relation to its size its people are one of the most cultured nations in the world. Its educational system is good, and Reykjavik possesses a university.

Greenland (14,000 inhabitants) is an enormous elevated plateau, largely covered with an ice sheet. A coastal strip of varying width, however, is free from ice on the whole. In the south there are scattered birch- and willow-trees, while the lichens and herbage provide pasture for some musk-ox and reindeer, but most of these animals are gone. The in-

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habitants are Eskimo, with Danish blood, known as Greenlanders. All traces of the early Norse settlements of the eleventh and twelfth centuries have disappeared, except a few ruins. Potatoes have been grown with difficulty in the south, but the great bulk of the food consumed is imported in exchange for seal oil, skins, and walrus ivory. The chief settlements are at Frederickshaab, Julianhaab, and Godthaab, which, with other settlements, are merely trading-stations. Trade is a monopoly of the Danish Government, which claims sovereignty over the whole island.

Overseas Expansion and Decline

The great period of Danish and Norwegian expansion was from the eighth to the eleventh centuries. During this period the Norse and Danes occupied parts of the Orkneys, Shetlands, Farøe Islands, Iceland, and Greenland and discovered the mainland of North America. The Normans occupied the region between the Cotentin peninsula and Rouen and conquered Sicily. Trade-routes were opened through North-west Russia and along the Mediterranean to Constantinople (Micklegate). Nevertheless, the facts that the primitive Norse tongue left only traces in Scotland and Northern England, that Danish practically disappeared from Eastern England, and that the Norman speech of the lower Seine was replaced by French before the end of the eleventh century, while Old Swedish was displaced in Russia before the end of the twelfth century, are evidence that the Scandinavian countries were not sufficiently densely populated to keep up the stream of emigration. In each case the seafaring adventurers were absorbed by the settled land population of the lands they conquered. The only evidence of the range of some of the Scandinavian voyaging lies in the sagas, which form the chief historical record of the period, 800–1100.

At its greatest extent, about 1100, the Danish Empire extended over a large part of Britain, Sweden, Norway, Greenland, Iceland, and North-west Russia. Of these countries England was by far the most fertile, and for several centuries the eastern rivers attracted small bodies—often

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only a few families—into the heart of the English plain. There is plenty of evidence that the new settlers did not displace the older inhabitants, except in those parts where they met with organized resistance, but the Norse racial strain is very marked in Eastern England and Scotland to-day. Unlike the Norse, the German traders did not intermarry with the people of the lands with which they traded, but built up a powerful organization which could draw upon the superior resources of the great valleys of Central Europe, so that when the struggle began for control of the overseas trade of Northern Europe the Danes were outnumbered and their resources outmatched by those of the Hanseatic League.

The commerce of Northern Europe during the Middle Ages was largely the exchange of simple manufactures for foods produced locally and for the luxuries prepared in Southern Europe or imported from the East. Throughout the general level of culture was lower than that of Mediterranean Europe. The total amount of trade was small, and was carried on in small vessels. This made it possible for Lübeck to construct a canal to the Elbe, through which the small ships were able to pass without being subject to the control of Copenhagen (page 572). The dominance of the Hanseatic federation was based on its control of the silver of Central Europe, the chief medium of exchange before the discovery of gold in America, and also on the presence of herring in the Baltic. Denmark's dynastic troubles and its lack of locally produced commodities sufficiently important for the development of an export trade kept it at the level of the small German city-states until the sixteenth century, when the discovery of the routes to India and South America revealed the importance of its control of the Sound.

Larger vessels were then built, and the Elbe-Trave Canal became useless for ocean trade. Lübeck had been strong enough to stop Swedish (Gotland) vessels entering the North Sea and Dutch vessels the Baltic. The Holy Roman Empire was nominally head of the German city-states, and so long as the Turks menaced Central Europe the Empire held together. With the voyages of the Portuguese the Turkish advance was stayed, and the Empire rapidly disintegrated,

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its dissolution being expedited by the Reformation, which divided the German cities. The weakening of Lübeck gave Denmark its chance of overseas expansion. The Dutch and English formed companies to trade with the Indies, the Dutch being more successful in the East and the British in the West Indies. The Danes formed an East India Company in 1618, and formed settlements at Tranquebar, on the Coromandel coast, and at Serampore (Frederiksnagor), but though the Danish and English were not rivals the rise of France in India checked further expansion. The Nicobar Islands were occupied by the Danes in 1756, but were finally abandoned in 1848.

It is of interest to note that to-day the only direct line of steamers between Europe and Siam is the East Asiatic Company of Copenhagen, an echo of Danish power and influence in the East.

The Swedish company founded no permanent colonies, but had a considerable trade with China. Their Delaware colony was captured by the Dutch in 1656. From this it might be thought that neither the Swedes nor the Danish had any colonizing ability, but this would not be true, as at all periods Scandinavians have been driven overseas by the poverty of their homelands. Even at the present day the Danes are still a much-travelled people and successful colonizers—*e.g.*, the Danish settlement at Daniverka, in New Zealand. Sweden might have developed overseas colonies if she had not been crippled by disastrous wars in the seventeenth century.

The most important tropical possession of Denmark was St Thomas, the great centre of contraband trade with the Spanish colonies, and one of the finest natural harbours in the West Indies. St Thomas, being neutral, flourished chiefly during the wars in which France, Spain, England, and Holland were engaged, and in 1755 the Danish Government purchased it from the Danish East India Company. Later, during the wars between Spain and her colonies, St Thomas had a second period of prosperity, which did not come to an end until slavery was abolished, in 1841. By 1867 the revenue from St Thomas and the Danish Virgin Islands had

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been reduced by earthquake, pestilence, and famine, and the Danish Government offered the islands to the United States for 7,500,000 dollars, but this was refused, and the islands remained Danish until the Panama Canal was opened, when the United States purchased them for 25,000,000 dollars, in 1917. The tiny Swedish West Indian island of St Bartholomew had a similar rise as a free port, but at the present time it is valueless, and is held by France. The Scandinavian settlements on the Guinea coast—Christianborg and Fredericksborg—were ceded to Britain. The Orkneys and Shetlands were also ceded to Britain.

Whereas both Holland and Britain were safe from Continental invasion, and did not have to dissipate their financial resources in buying off invaders or in the preparation of costly defences, Denmark and Norway, which retained feudal conditions and absolute monarchies long after they had been abandoned in Holland and Britain, were frequently engaged in dynastic and religious wars. During the Thirty Years War, which held up the economic development of both Central and Northern Europe, Britain and Holland remained neutral, and Amsterdam and London were able to build up their financial reserves. The Danes would not have been able to enter the East India trade but for the fact that they were able to close the Sound to Dutch vessels. It was this control of the Sound which gave Copenhagen its importance in international trade, but as Denmark was unable to remain neutral during the Napoleonic wars its fleet was taken by Britain, and it was forcibly separated from Norway. Nevertheless, it continued to command the Sound, and levied an increasingly important toll on all foreign shipping passing between the North Sea and the Baltic, until in 1857 the tolls were abandoned in exchange for a cash payment of £4,000,000.

CHAPTER XXIV

POLAND AND THE BALTIC STATES

POLAND

THE new state of Poland comprises the old provinces of West Prussia, Posen (Poznań), Russian Poland, Austrian Galicia, and the smaller areas of Hultschin (Teschen or Cieszyn), Wilno (Vilna), Polish Ukraine, Volhynia, and Podolia, together with the greater part of Upper Silesia. In fact, the western frontiers are approximately those of 1648 and the eastern frontier that of the time of Peter the Great. Pomerania (Pomorze) and Upper Silesia have not been under Polish rule for several centuries, though they contain a considerable Polish population.

We are not concerned here with the justice of the annexation of West Prussia, Poznań, and Upper Silesia, where the boundaries have been fixed without reference to the populations concerned, nor with the wisdom of establishing national boundaries on a racial or a linguistic basis, but we are compelled to note that, both on the east and on the west, there is bitter hostility between Poland and its neighbours. The Polish point of view is that the Slavs were the original inhabitants of all the country lying to the east of the Elbe, while the Germans claim that the whole of this area was so scantily populated during the sixth century that there is no evidence of a Polish state at such an early date, and that the Poles, who formed only a part of the Slav settlers, were unable to cultivate clay soils or drain swamps until the incoming German colonists had taught them how to do so. In other words, the Poles had not established a Polish state before A.D. 1000, and before that time the Goths and the Pruzzens and Kaschubs, who were no more closely related to the Poles than are the English to the Germans, had formed independent settlements. The economic development of Poland dates from the annexation of West Prussia in 1772, and is undoubtedly largely the fruit of German enterprise.

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Underlying these conflicting claims are the fundamental facts: (i) that the Poles breed more quickly than the Germans, and tend to form a reservoir of cheap labour which may be a menace to the standard of living in those regions where the two races are in peaceful competition, (ii) that the Poles are principally Catholics and the Germans Protestants, (iii) that the Poles possess the second largest military force in Europe, while Germany is practically defenceless, and (iv) that the standard of technical and administrative efficiency of the Poles is greatly inferior to that of the Germans.

One has not to search far to find numerous cases of friction caused by the planning of the western frontier of Poland. The Treaty of Versailles internationalized the lower course of the Vistula, but the boundary, being made to follow the right bank of the river in West Prussia, cut off Prussia from access to the river except in the single port of Kurzebrack, access to which was blocked by wooden fences and barbed wire until 1925. As in Upper Silesia, the actual boundary-lines are sometimes grotesque in their absurdity. In West Prussia, for example, there are a number of estates which are cut in two by the frontier line. Thus at Gutsch the manor-house and one half of the stables lie on the German side, while the gardens and fields and the other part of the stables are in Polish territory.

The Vistula is navigable for steamboats as far as Kraków, and should be of great value for commerce. As the summer rains added to the snow-water of the Carpathians lead to destructive floods in the lowlands, it is necessary to keep in repair the embankments of the lower Vistula. During the period before 1914 the Germans maintained the banks so as to ensure deep-water navigation as far as the old frontier near Thorn (Toruń). During that time there was no recurrence of the disastrous floods, such as that which happened at Marienwerder in 1888 and drowned 25,000 people. At the present time, under Polish rule, the dikes are falling into a bad state of repair and sandbanks render navigation extremely hazardous, the traffic being less in one month than it was in former times in one day.

If Germany had access to the Vistula it is probable that

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she would make it her business to keep her bank in repair, and possibly Poland might be induced to co-operate in improving the waterway. Another West Prussian river, the Nogat, although regulated and not subject to floods, is almost unused because access to the Vistula is denied. The meadows which border the Drewenz have been under water for several years, and have become wholly unproductive.

The Polish corridor was established to allow Poland access to the sea, but its existence has created a defenceless island territory in East Prussia, which could at any moment be overrun by Polish troops or irregulars. In Poland every second adult male belongs to some military club or society. These clubs are equipped with arms and uniforms, and are trained by regular officers. In the event of civil war in Poland there is an ever-present danger that these armed Polish bands may encroach on German, Lithuanian, or Russian territory. In 1921, during the war against Soviet Russia, such bands actually crossed the frontier of East Prussia. In view of this contingency there is a nervous tension along the frontiers which might lead to incidents which would precipitate war. From the commercial and industrial point of view this frontier tension is bad, and production and trade in the territories adjoining the Polish border have declined. A German corridor would put Polish Baltic trade at the mercy of Germany, and it may be claimed that the Polish corridor can hardly be used for military operations against Germany. Against this it may be claimed that the Polish corridor is of political rather than commercial importance. The great currents of commercial energy no longer go from north to south, as in the Middle Ages, but from east to west, and the Polish corridor is an obstacle to trade in as much as it forms a kind of economically dead country in the middle of Germany. This raises freightage costs between East and West Prussia and the rest of Germany and reduces the productivity of Polish West Prussia and Poznań, which were formerly the granary of the German Empire. In this region were produced more than 3,000,000 tons of grain, including one-fifth of the entire crop of rye, and 11,000,000 tons of potatoes and sugar-beet, one-third of the German

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output. Moreover, there were more than 4,000,000 head of cattle, horses, and pigs in the two corridor provinces and a net import from East Prussia of 191,000 cattle in 1913.

The natural trade between Poznań and East Prussia is an exchange of grain for cattle, but as the cattle needed in Poznań are now obtained from Central Poland East Prussian production is in a state of decline and the local industries have decayed. This has reacted on the financial position of East Prussia, where the rates of interest are higher than elsewhere in Germany. Internal trade is paralysed, and there has been an increase in emigration. Undoubtedly the creation of the corridor has led to a retarding of economic development, and at the present moment there may be more than an element of truth in the statement of Dr Kreis that "the once German East has become a hotbed of economic nonsense," and it is certain that Germany will not be satisfied until free communications are established with East Prussia.

The fact that we have to bear in mind is that Poland is transitional in character and forms a link between the relatively undeveloped Eastern and the more industrialized Western countries. Its modern development may be compared with that of Canada. In 1772, when it was in part annexed by Germany, its stage of development was at about the same level as that of French Canada. In place of Polish serfdom the Prussians granted the peasants more freedom. Canals were built, lumbering was started, and great farms developed for the large-scale production of foodstuffs for export to the more densely populated regions of Europe. Thus far there is a similarity between the development of Canada and Poland. Both had two races with two distinct religions, and lived at different stages of intellectual and technical development. As in Canada, the subject nation retained its own language and nationality, and more than held its own in economic competition with the ruling race. But here the comparison ends. The Germans were not as successful as the North Americans in dealing with their subject races, but it must be remembered that the old German boundary was almost as artificial as that which separates

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Canada and the United States. Unlike the latter, however, the frontier separated nations at very different economic and cultural levels, and the establishment of new frontiers is a matter of extraordinary difficulty.

The fact emerges that Poland, as it exists at the present day, is a buffer state created to separate the Great Powers of Russia and Germany. Its frontiers are as 'natural' as those of Ontario and Manitoba, the Yukon and Alaska, Alberta and British Columbia. It is only an independent economic unit in so far as it is bounded by tariff walls, which will inevitably be modified as the interdependence of Russia, Poland, and Germany is more generally appreciated. It is quite within the bounds of possibility that the Polish state is transitional in an historical as well as in a geographical sense. It may possibly form one of a group of provinces in a commercial federation of the nations which occupy the North European plain.

Racial Problems of Modern Poland

The North European plain was very scantily populated by Nordic tribes from the close of the glacial period till about A.D. 1000, when Slav settlers drifted into the region lying to the east of the Elbe. At that time much larger areas consisted of marshland and forest, which the Slav races had not been able to clear or to drain. As a result the chief areas of settlement were the patches of loess and sandy morainic soils which stretch in a series of low ridges from east to west. Here people of Nordic and Slav origin settled down peacefully. With the use of iron the forest clearings increased, and the Slav dukes encouraged the settlement within their territories of German peasants and artisans, who improved agriculture and founded industry and trade.

Most of the important towns date from this period, and there emerged two distinct types of settlement—the agricultural market centre and the chief's fortress-capital. The principal towns were both markets and administrative capitals, as in the case of Kraków, Warsaw, and Poznań. Political conditions in a scantily populated region of forest and

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grassland were frequently unsettled even after the great migrations had stopped. It must be realized that not only were the peoples inhabiting these regions at many different stages of development, but that some were heathens, and the Christians were not all under the unifying influence of the Roman Catholic Church. Little wars were almost inevitable, and the desire of the Poles for some protection against the warlike peoples of the Baltic Sea led them to encourage the conquest of East Prussia by the Teutonic knights.

In the meantime bodies of German traders established ports at the mouths of the most important Baltic rivers, and Danzig, at the mouth of the Vistula, became the principal outlet of the Vistula basin. When in 1772 West Prussia was annexed Poland was cut off from access to the Baltic. Finally, in 1793-95, the inland parts of the Polish state were divided between Austria, Germany, and Russia, and for more than a century the economic development of the sections kept pace with that of those states. The result was that when in 1918 the old frontiers were restored Poland's economic condition was not uniform. In the west Poznań and West Prussia had been opened up in German colonies established not so much to Prussianize Poland as to check the German emigration overseas, and to take the place of the constant drift of the people of Poznań and West Prussia into the great towns and industrial districts. By 1914 there were no less than 250,000 Poles in the Rhenish-Westphalian coalfield. The Germans claimed that they formed a small majority of the provinces of Prussian Poland and West Prussia, but it is probable that the 1910 census returns were incorrect, as (i) the tables were based on language, and many bilingual people were reckoned as Germans; (ii) regiments in Poland were German, those of Polish nationality being quartered in other parts of Germany; (iii) there is a possibility that the figures were falsified to give the idea that the number of Poles had decreased in proportion to the number of Germans.

At the present time there is still a strong minority of Germans in the two corridor provinces, but as the German

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children are not allowed to receive instruction in their own language German influence is decreasing, and many German families have left, passing through the great refugee camp at Schneidemühl into Germany. The Poles form nearly 70 per cent. of the population of Poland, but there are considerable minorities of Ukrainians (14 per cent.) and Ruthenians in the south-east and of Lithuanians in the Suwałki district of the north-east. The Germans are concentrated in the towns of Poznań, West Prussia, and Upper Silesia. Probably there are about 4 per cent. of Germans and 4 per cent. of Russians living within the Polish borders. Jews number nearly 8 per cent. Since 1924 proposals have been made for the education of the racial minorities in their own language, but few practical steps have been taken as yet.

Population and Emigration. The only European countries with a larger population than Poland are Russia, Germany, Britain, France, and Italy. The average density of population in Poland is 182 persons per square mile, and varies from 55 per square mile in Eastern Poland to 700 per square mile in Upper Silesia, which is more densely populated than Belgium. The Poles increase more rapidly than any of the West European peoples, and their rate of increase would be even greater were it not that the death-rate is so high. In a decade the number of Poles increases by 15 per cent. (*cf.* Italy 13 per cent., Germany 10 per cent., and France 2 per cent). In spite of less intensive methods of cultivation, there are more people in the cultivated areas, and the standard of living is lower than in any part of Western Europe. As a result Poland is one of the greatest reservoirs of labour in Europe. In 1920 there were more than 6,000,000 Poles living outside Poland's borders. Before the World War more than one inhabitant in five found it necessary to emigrate, chiefly to Germany and the United States, while nearly 750,000 had made their homes in Russia.

The War arrested voluntary emigration, and at its close there were 1,200,000 Poles in Russia, 840,000 in Germany, and 1,300,000 in Austria who had to be brought within the Polish frontiers. In Westphalia alone there were 400,000, and as they could not return *en masse* many made their way

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to France, which now possesses 450,000 Polish citizens. Since 1920, moreover, the frontiers of the United States, Germany, and Russia have been virtually closed to Poles, the United States quota having been reduced from 150,000 to 9000.¹ There is some secret emigration to Germany, 40,000 labourers crossing the frontier for the harvest season, but the proportion of emigrants has been reduced to 3 per cent. of the Polish population, and these make their way to Palestine, the Argentine, and Canada, the only European countries which offer them new homes being Austria, Denmark, Rumania, and Switzerland.

Drainage

Poland is a plain transitional between the smaller German plain on the west and the larger Russian plain on the east. Though it is extremely flat it forms part of the watershed between the Baltic and Black Seas. The low watershed would make it easy to develop a system of canals uniting the navigable rivers of the Black and Baltic Seas. It must be remembered, however, that on an average the inland waterways in this part of Europe are frozen for about 108 days, nearly 30 per cent., of each year. If ice-breakers were used the period of inactivity due to ice could be halved. The rainfall is generally sufficient for river navigation.

The Vistula is the principal river, and its basin occupies the greater part of Poland.

The Upper Vistula. The Vistula rises in the Barania range in Silesia, and flows eastward through Galicia, following a wide glacial valley known as the Oświęcim plain. Here, as in the lower course, it is liable to the sudden floods which distinguish it from the better regulated Oder. Before reaching Kraków, the limit of steamboat navigation, it turns eastward and enters the Galician plain, where it receives its principal tributaries, the Wisłoka, which is navigable for small boats in its lower course, and the San, which becomes

¹ The quota is the number of emigrants of a State who are allowed annually to enter the United States. Every State has a quota assigned to it.

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navigable below Leżajsk. Throughout the Galician plain the Vistula is liable to severe floods from the melting snows of spring and the rainfall of the summer months, and it is generally frozen from December to March. By an agreement between Austria and Russia in 1864 the river was to be regulated, but by 1913 less than two-fifths of the work had been completed. There are three annual floods, in March, June, and September, which break down the banks in the unregulated stretches of the river, and cause large shifting sandbanks, which impede navigation, sometimes causing it to be suspended altogether. The floods are succeeded by periods of very low water, which have an equally bad effect upon traffic. The fleet on the Vistula formerly consisted of 135 small steamers, of which more than half were German. There used to be a passenger service from Sandomierz on the Galician border to the old German frontier. The principal items of goods traffic were timber, stone, coal, lime, hides, and petroleum, but none of the vessels carried more than thirty-five tons. Attempts are being made to restore the steamer services.

The Middle Vistula. Below the junction of the San the Vistula passes through a broad, well-timbered valley between the Lysa Gora and Lublin Heights, and enters the plain of Central Poland at Dęblin (Iwangozrod), where the Wieprz river joins it. From its junction with the San the Vistula is being canalized. The work was started in 1887, but not more than three-quarters of it had been completed in 1914. Throughout the middle course the fall is slight, and in consequence there are many meanders. The valleys of the east bank tributaries, the Wieprz, Bug, and Narero, are flat and marshy, and as their headstream districts have been left undrained they form an excellent line of defence between Russia and Poland, the gaps between the marshes being defended by fortresses. Brześć-Litewski (Brest-Litovsk) commands the entrance to the Bug valley, while Grodno and Białystok command access to the Narero. On the west bank the Pilica (Pilitsa) is navigable for rafts from a point near Novoradomsk. Similarly, the Bug and its tributary the Narero (Narew) is sometimes navigable, and is linked by

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the Augustów Canal with the Niemen. This canal was built in 1825, and is continued beyond the Niemen to Windau (Ventspils). After railways were introduced it lost its importance, and has been allowed to fall into disrepair. It is still used to a small extent for the transport of timber.

The middle course of the Vistula was formerly an important means of communication, but by 1914 it had begun to decline, and as the outlet was not in Russian territory the Russian Government tried to divert the traffic to Libau. In consequence, the middle course of the river was not properly regulated. The Vistula, Pripet, Niemen, Narero, Bug, and Styr could be improved for 400-600-ton barges, but as capital is not yet available the amount of traffic carried by water in Central Poland is practically negligible.

There are passenger steamers between Warsaw and Płoch, a distance of sixty miles, but before the War passengers were carried by the Bug and the Royal Canal (1846) to Pińsk, the limit of navigation of the Pripet, which gives through communication to Kiev, on the Dnieper. Just before the War it was proposed to improve the Polish part of this route to make the Warsaw-Kiev waterway available for 1600-ton vessels. Since the War the eastern section of this route has not been reopened. Dredging is badly needed, and it should be noted that whereas there are forty dredgers on the Volga and twenty-five on the Dnieper, there is none on the Vistula. It is proposed to put between five and ten dredgers on the Polish waterways. When it is remembered that vessels drawing more than six-ton loads are confined to the estuaries, while the average depth of the great Polish rivers is less than three feet, the magnitude of the task of improving the Polish waterways, and the fact that there is a very small commercial tonnage on the waterways, may be appreciated.

The Lower Vistula. In its passage through the wide Eberswald-Thorn (Toruń) valley the Vistula splits up into a number of channels, but after entering the Pomeranian Voievodship (formerly West Prussia) at Otlotschin—the fortress near Toruń—it is 300 yards wide, but only three and a half feet deep; its channel lies between banks which were

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kept in good repair until West Prussia was ceded to Poland. For thirty-three miles from the point where the Drewenz river joins it the Vistula flows north-westward to the elbow bend where the Brda (Brahe) enters. From this point the Vistula formerly ran westward to the Elbe, and its old valley (Netze) forms an easy route for the east-west waterway, the Bydgoszcz (Bromberg) Canal, which links the Vistula with the Noteć (Netze) and Warthe (Warta) rivers, and thus with the Oder and Stettin. The Bydgoszcz Canal was enlarged by the Germans between 1914-16, but since the canal has been in Polish hands the amount of timber rafted through it has fallen from more than 1,000,000 cubic metres to less than 200,000 cubic metres in 1926. In former days boats of 150 tons made their way between the Vistula and Oder by this route, and a very considerable traffic in grain and timber was carried on through Bydgoszcz.

From the rectangular bend at the mouth of the Brda the Vistula breaks through the Polish heights and passes through the dead river-ports of German West Prussia—*e.g.*, Marienwerder—and expands into delta beyond Pieckel. Formerly the main stream bent to the west at Einlage, and flowed for eighteen miles behind a sand spit to the sea, at Neufahrwasser, while branches flowed from Pieckel to the Frisches Haff near Elbing, and from Einlage to the Frisches Haff. In 1840 an ice blockage caused the river to break through the spit above Danzig, and the consequent lowering of the river-level made it possible to build dams or locks at the entrance to the Nogat, Elbing, and Danzig branches of the Vistula. The Elbing Vistula and the Danzig, or Dead, Vistula are now used as canals. The Nogat arm of the Vistula was canalized as late as 1915, and connects the Oder basin by the Bydgoszcz Canal with the Königsberg Haff, and thence by the Pregel and Derme to Labiau, which is connected with the Kurisches Haff and Memel.

In 1895 the present outlet of the Vistula was artificially cut from Einlage to the sea at Schiewenhorst in order to avoid the damaging effect of ice and floods. The Danzig Vistula and the Elbing Vistula have been canalized to a depth of 16½ feet. Between these two branches a channel

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has been cut from Einlage and a sea-lock constructed at Schiewenhorst. These improvements to the lower Vistula were carried out by Germany in order to safeguard the plain of Gdansk from floods, and the concentration of the floodwaters in the new outlet of Schiewenhorst has made it possible for Poland to construct a new railway and river-port at Gdynia, which lies just outside the north-western boundary of the State of Danzig. Given stable conditions, there seems no adequate reason why the Vistula should not be developed into a fine system of internal waterways, but at the present time the financial position of Poland is not sufficiently strong to justify the enormous capital outlay required.

The Polish Government propose to construct three large new canals to accommodate vessels of 1000 tons.

(a) The Coal Canal between Katowice, Łęczyca, Lake Gosławice, Lake Gopło, and the mouth of the Brda. This would enable Poland to export coal through the Baltic from Upper Silesia.

(b) The East-west Canal from Poznań to Konin, Lake Gosławice, Łęczyca-Warsaw-Brześć, and Pińsk.

(c) From Katowice to Kraków, and thence to the Dniester.

It is estimated (in 1919) that the reduction in freightage by the construction of these waterways would attract a great deal of traffic to the projected routes.

ESTIMATED FREIGHTS IN ZLOTYS PER TON

(1 zloty = 6d.)

	By Rail	By Water
Katowice-Łódź	8.5	3.1
Katowice-Warsaw	10.8	4.8
Katowice-Bydgoszcz	12.7	5.3
Pińsk-Gdansk	17.2	8.5
Pińsk-Poznań	14.3	7.7
Ekaterinoslav-Warsaw	30.9	9.5
Ekaterinoslav-Katowice	32.6	13.3
Ekaterinoslav-Gdansk	35.2	12.9
Ekaterinoslav-Berlin	45.8	14.2
Ekaterinoslav-Rotterdam	57.7	20.8

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In 1911 the amount of traffic on the water which might be affected by the proposed waterways was:

	From Russia	To Russia
Baltic Sea . . .	6,400,000 tons	6,600,000 tons
Black Sea. . . .	5,600,000 „	3,000,000 „
Sea of Azov . . .	4,200,000 „	450,000 „
By rail through Poland	5,800,000 „	2,600,000 „
	<hr/>	<hr/>
Total	22,000,000 „	12,650,000 „

It is certain that if low freightage rates were charged a considerable proportion of Russia's traffic would pass through Poland, but it is doubtful whether there would be an economic return on the capital expenditure needed in the construction of the waterways projected.

The *Warta* (Warthe) rises in the heights of Kraków, and flows north-westward to the Oder. In flood-time, however, some of its water escapes eastward to the Vistula. This peculiarity made it easy to link the Vistula with the Oder. The *Warta* is connected with the *Bzura*, a tributary of the *Vistula*, by the *Łęczyca* (Leuchitsa) Canal. The *Warta* is navigable as far as *Poznań* for boats of 175 tons, but in summer the water is so low that the barges do not carry more than sixty tons. During the German occupation of *Poznań* (Posen) the *Warta* was neglected, in order to prevent competition with the State railways (*cf.* the *Moselle* valley). The *Warta* is free from ice for between 270 to 290 days each year.

The *Niemen* rises in the high land which lies between *Vilna* and *Minsk*, on the north-eastern frontier of Poland. It has a slight fall, and flows through a wide depression which is an eastern continuation of the *Eberswald-Toruń* valley. At *Grodno* it turns northward, and finally discharges into the *Baltic* through the *Kurisches Haff*. Sixty miles above *Grodno* it is joined by the *Szczara* (Shara), and is navigable for boats of 300 tons from that point to the mouth. It is blocked by ice for a longer period (four months) than any of the other Polish rivers. Above *Kovno* the river has many shallow reaches through which navigation could only be carried on

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during the floods of spring and early summer. Between Grodno and Olita, the limit of navigation, small barges can be used during the eight months that navigation is open. The whole of the traffic is carried on in Lithuania, the Polish district of Suwałki being thinly populated.

The *Dniester* rises to the south of Przemyśl, in Central Galicia. It flows south-eastward through the Galician depression. Its fall is slight, and its banks are marshy. It is of little value as a waterway, as it can be used only for rafts, the total traffic being 28,000 tons. It is joined by a number of streams which drain the Podolian plateau, and some of its tributaries are navigable. The main valley is frequently flooded.

Climate

As the highest land is the most southerly, temperature conditions tend to be uniform between north and south. On the whole, it may be said that the climate of Poland is transitional between the maritime climate of North-west Europe and the continental climate of Russia. At Poznań the mean annual range of temperature is 37° F. (29° F. in January, 65° F. in July). The range of temperature increases toward the east, being 44° F. at Pińsk.

The following table summarizes the characteristic climate divisions of Poland:

District	January Temperature	July Temperature	Range	Frost Season	Annual Rainfall in Inches	Per- centage of Rainfall in Summer
West—Poznań .	29° F.	65° F.	36° F.	90 days	19·6	64
North-east—Vilna .	22·1° F.	65° F.	43° F.	122 „	24·4	61
Centre—Warsaw .	26° F.	66° F.	40° F.	114 „	23·2	68
South-west—Kraków	26° F.	66° F.	40° F.	114 „	25·2	64
South-east—Lwów .	24° F.	66° F.	42° F.	122 „	27·2	66

It is clear therefore that so far as summers are concerned there is practically no difference between the various parts of the plains of Poland, but it should be noted that frost

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may occur for four months in the east and for three months in the west, and that the cool springs and autumns are long and the growing season is short. The shortness of the agricultural season makes it necessary to hurry the harvest and to obtain additional labour for it from outside. The chief climatic differences are in respect of rainfall, which varies from seventeen and a half inches in the Vistula depression to twenty-three and a half in the higher parts of Central Poland. In Polesia and the Podolian plateau the rainfall is from seventeen to nineteen inches, in the Galician plain twenty-four inches, in the Carpathians from thirty-eight to forty inches. As over 60 per cent. of the rain falls in the summer half-year there is no marked deficiency, and cereals can be grown on a large scale—rye and oats being the most important crops everywhere, while wheat is chiefly produced in Upper Silesia and in the south-east.

The transitional character of the climate makes Poland a suitable region for the production of seeds. It is found that Western European grains sown in the arable lands of Russia and the Ukraine rapidly degenerate because they cannot stand the severe climate. If they are first acclimatized in Poland the resulting seeds resist the climates of Eastern Europe and give good crops. Not only grains, but Polish seed-potatoes and beet are exported to Russia, the Ukraine, and the Baltic and Balkan states.

Forests

Nearly a quarter of Poland is forested, the bulk of the trees being pines (65 per cent.) and other conifers (15 per cent.), while in the south and south-east there are forests of oaks and other deciduous trees (20 per cent.), especially in the heavy soils of Volhynia. Forestry has been carried on for many years in the centre and west, where pines are cultivated. In the north-east the forests are of a mixed type, which provides pulp-wood suitable for paper manufacture. The Carpathians are covered with firs.

The largest forests are in the east, especially in Vilna, Novogródek, Polesia, and Volhynia, while in Stanisław and

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Silesia more than a third of the area is under timber. The chief lumbering districts are in the north and centre, especially in those parts of the Bydgoszcz, Białowieża, Augustów, and central forests which have rivers and canals along which timber may be rafted. As a rule the forest companies are small, the chief sawmills being at Bydgoszcz, to which timber is sent by the Bug, Augustów, and Royal Canal routes. It is in this neighbourhood that the greatest amount of water-power has been developed.

The great north-eastern forests of the Białowieża and Augustów districts extend throughout the area bounded by Białystok, Wolkowysk, Brześć, and Kobryn, and form the greatest single forest area in Europe. Here and in Suwałki the communications with the coast are not so good, and large quantities of timber are consumed in the great wood-distillation works at Hajnówka. Nevertheless, there is a considerable timber export from the north-east. The total lumber output is about 21,000,000 cubic metres, and there are about 200 sawmills, which cut about 6,000,000 cubic metres of planks each year. Forty thousand tons of cellulose are manufactured, and the output of paper is gradually reaching pre-War proportions (1913 output 62,000 tons, 1923 output 45,000 tons). Nearly 1,500,000 tons of timber are exported annually from Danzig alone, and Poland now controls 12 per cent. of the world's trade in timber, more than 3,000,000 tons of timber and timber products being exported each year to Germany, Belgium, England, and Holland.

The manufacture of matches is a State monopoly, and in 1924 54,000,000 boxes were produced, more than 11,000,000 being exported chiefly to Germany and Lithuania.

Agricultural Development

The surface of Poland consists of 48·6 per cent. arable land, 23·2 per cent. forest, 16·9 per cent. permanent pasture, and 11·3 per cent. marsh and moor. The proportion of arable land is higher than that of most of the European states. The soil of Poland is fertile, being largely composed of the

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silt of ancient glacial lakes. Even in Central and Eastern Poland agriculture had been industrialized before the War, and depended on the cheapness of agricultural labour (£4 a year for men and £2 for women). As a result large crops of rye, oats, barley, and wheat were grown, potatoes and sugar-beet were extremely important, while such industrial crops as colza, flax, and hemp occupied large areas. For many years cereals and cattle were exported, but the trade in both declined because of Russian competition. As the number of peasant farms worked on the three-field system increased the area under sheep declined, and the small farms became less efficient than the large capitalist estates. The peasants were even less efficient than those of the Baltic states. It is probable that about half the farms were producing less than similar areas in other countries, and the Russian Government manipulated railway rates in order to give an unfair advantage to distant Russian producers. Nevertheless, nearly half the area of Poland was tilled, the proportion of arable land under cultivation increasing from about 27 per cent. in the east to 66 per cent. in the centre and west. During the War the area under cultivation decreased, nearly 20 per cent. of the arable area becoming unproductive, especially in the east, where the War damage was greatest. After the War recovery was slow and painful—a large proportion of the population of the eastern provinces living in disused dug-outs for several years after the close of hostilities. In 1924 there was a partial failure of the crops, and foodstuffs had to be imported. Normally, however, there is a large surplus of agricultural produce, especially of grain, potatoes, and sugar-beet, but in no case has production reached pre-War dimensions. The area under plantations has increased more rapidly than the area under cultivation, an indication that labour is considerably cheaper than capital.

Of the cereals produced 56 per cent. are sown in autumn and 44 per cent. in spring. Of the cultivated area more than half is occupied by grains, rye occupying 13 per cent., oats 7 per cent., and wheat 3 per cent. of the total area of Poland. Rye forms the chief food crop, even in the districts where

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wheat can be grown. Poland ranks third among European rye-producing countries, and fourth among those which produce oats. Barley is chiefly important in the west; it possesses good malting qualities, and is the chief grain exported. The area under hops is increasing, but owing to economic conditions, and especially to the rise in the cost of labour in the west, the centre of hop cultivation is migrating slowly toward the east.

As in the case of grains, the chief centres of sugar cultivation are in the former German provinces of the Polish corridor. The sugar refined at Poznań and Pomorze was formerly used in Germany, but is now exported chiefly to Britain and Holland (1920 export 1,430,000 tons, 1928-29 export 385,000 tons).

Potatoes occupy 13 per cent. of the cultivated area, and Poland produces approximately one-quarter of the world's output, 30,000,000 tons. Potatoes form the chief food of the poor, and are also used for stock, especially for pigs. White potatoes are used as food and for distilling, but there has been a considerable increase of the yellow variety, which is exported to Western Europe. Poland is one of the largest producers of potato-starch in Europe, there being ninety-five starch-works in Poznań and Pomerania, with an output of about 60,000 tons. Besides starch, large quantities of alcohol syrup and potato-flour are made. There are about 1,200 distilleries, which produce nearly 90,000,000 litres of alcohol, while 26,000 tons of potato-flour are exported. Altogether 17 per cent. of the arable area is occupied by root crops, while forage crops occupy another 8 per cent., and about 1 per cent. is under such industrial crops as flax, hemp, osiers, and poppies. Poland is the second flax-producing country, the crop being chiefly grown in the east, where both labour and land are cheap. The largest flax-mills are at Żyrardów, near Warsaw, four-fifths of the fibre exported going to Czecho-Slovakia, and a smaller quantity to Germany. Agricultural production has greatly increased since 1924, and the ratios of the present-day output (1930) to that of the pre-War years are in the case of wheat 82 per cent., rye 96 per cent., oats 94 per cent., barley 97 per cent.,

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potatoes 99 per cent., and sugar 97 per cent. There is a considerable export to Russia of seeds acclimatized in Poland—potatoes, sugar, grain, etc.

Pastoral industries have almost entirely recovered from the effects of War conditions. Cattle are most numerous in the river valleys of the centre and west. Dairy-farming is increasing in importance, especially in the west. Horses are important in Central Poland and Galicia, especial attention being given to them in the province of Radom. Pigs are reared to a much greater extent than formerly, especially in the grain and dairy-farming districts of the centre and north-west.

Poland possesses the second largest number of pigs and horses and the third largest number of cattle in Europe.

PERCENTAGE OF ARABLE LAND UNDER STAPLE CROPS

Crop	North-west	South-west	Central Poland	Galicia	East	Total
Rye . .	50·4	30·0	41·7	24·5	49·2	40·2
Barley . .	12·4	31·4	21·1	25·6	22·3	21·1
Potatoes . .	23·8	21·6	20·1	19·7	13·0	19·4
Oats . .	8·1	7·4	9·2	13·4	9·8	10·1
Wheat . .	5·3	9·6	7·9	16·8	5·7	9·2

THOUSANDS OF HEAD OF STOCK

Stock	North-west	Central Poland	Galicia	East	Total
Cattle . .	1265	3021	2294	1258	7838
Pigs . .	1396	1816	942	942	5119
Horses . .	418	1307	848	619	3192
Sheep . .	622	725	273	273	2167

In 1930 nearly 383,000 tons of rye, 50,000 tons of wheat, 216,000 tons of barley, and 30,000 tons of oats were exported, chiefly to Czecho-Slovakia, Germany, Denmark, Britain,

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Belgium, and Finland. Three hundred and ninety-five thousand tons of sugar were sent to Germany, England, and Holland. Seed-potatoes, cereals, sugar, peas, beans, and timber are also exported to Russia and the Ukraine, and to the countries of the Baltic and Black Seas.

It should be noted that whereas 75 per cent. of Germany's arable land has been improved by artificial means the Polish plait is practically undeveloped. The average consumption of artificial manure in Poland in the former Prussian province of Poznań was 325 lb. per acre, whereas in the east the use of fertilizers was almost negligible, 5 lb. per acre. Not more than 4 per cent. of the arable area of Poland can be considered as improved land. There is little doubt, however, that as two-thirds of the people are engaged in agriculture the prospects of the future development of agriculture in Poland are bright if capital be forthcoming. Unstable political conditions, the absence of machinery, and the general backward state of the people are the principal reasons why Polish agriculture lags behind that of Canada.

Mining, Manufacturing, and Trade

Throughout the greater part of Poland the surface is covered by recent deposits, which contain no minerals of importance save brick-earths and pottery clays, which are worked in Poznań and Vilna. In the south-western and south-eastern plateaux, however, there are outcrops of Carboniferous, Jurassic, and Tertiary rocks, which contain extremely valuable deposits of coal, salt, and petroleum.

Coal

The Polish coal basin is a part of the Silesian-Moravian-Kraków basin, which forms the second greatest single coalfield in Europe. According to present estimates the amount of coal lying within 3000 feet of the surface is nearly 64,000,000,000 metric tons (*cf.* Germany, 359,000,000,000 tons, and Britain 198,000,000,000 tons). The seams are very thick, and lie at an average depth of between 600 and 1200

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feet. Though generally bituminous the coal is not rich in gas, and can be worked safely. The low rates of wages paid in the mines give Poland the lowest cost of production in Europe—35–40 per cent. less than Britain. Since 1922 Poland has ranked fourth among the coal-producing countries of Europe. In 1929 the total output of coal in Poland was 46,200,000 tons. The 1913 output of the coalfields now owned by Poland was about 41,000,000 tons, so that it will be seen that the mining areas have completely recovered from the dislocation of trade caused by the rearranging of the political and tariff frontiers.

1. The *Dąbrowa coalfield*, on the north of the Upper Silesian coalfield, produced about 6,800,000 tons in 1913, one-fifth of the total output of Russia. The coal is of good quality, and is often found in seams of from twenty to thirty feet in thickness, and close to the surface. Though bituminous it does not form a good blast-furnace coke, and is principally used for manufacturing purposes in the industrial districts of Łódź and Warsaw, and in the zinc-smelting industry of Tarnowski Góry. By 1922 the production of the Dąbrowa field had increased to more than 7,000,000 tons, and though its reserves are smaller than those of the other fields its rate of production alters little.

2. The *Kraków coalfield* is the least developed of the Polish mining districts, though it possesses more than one-fifth of the total coal reserves. As in the case of the Dąbrowa field, the coal is largely used in local industries, and production of nearly 2,000,000 tons is practically a constant level. Less than a quarter of the output is exported.

3. The *Upper Silesian coalfield* is the most important region both as regards reserves (40,000,000,000 tons) and output. In 1925 about 41 per cent. of the output of the Silesian mines was exported, chiefly to Germany (6,000,000–7,000,000 tons) and Austria (3,000,000 tons), though smaller quantities find their way to Hungary, Czecho-Slovakia, and Danzig. The lack of labour during the War and the dislocation of commerce and industry consequent on the partition of Upper Silesia caused a considerable decline in output of the Upper Silesian mines (32,000,000 tons in 1913, 22,000,000

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tons in 1918, 37,000,000 tons in 1930). In 1925 disputes between Germany and Poland caused the former to put an embargo on Polish coal, but it is probable that when the difficulties between the two countries have been removed the production of Upper Silesia will exceed pre-War levels. The outstanding fact about Upper Silesia is that its transference to Poland has made that country industrially independent of Germany, though the Poles will still need the advice and assistance of German organizers and technicians. Unlike the other Polish coalfields, Upper Silesia has coal which can be made into blast-furnace coke. Its by-product plants annually produce about 60,000 tons of coal-tar, 24,000 tons of benzol, and 24,000 tons of ammonium sulphate, together with 1,370,000 tons of coke.

The chief coal-mines lie in the neighbourhood of Katowice and Królewska Huta (Königshütte), though there are outlying pits near Nikolai and Rybnik, in the south.

Poland's Coal-export Trade. The export of coal from Poland is limited by the great distance between Upper Silesia and the sea-coast. More than half of the exports normally go to Central European countries, and a little less than half to Scandinavia, the Baltic states, and France. Nevertheless, the Upper Silesian coal is produced cheaply, and can be carried by the Oder and Elbe waterways and by the German and Polish railways to Stettin, Hamburg, Danzig, and even to Bremen. Usually the greater part of this trade is through the German ports, but shipments through Danzig and Gdynia are rapidly increasing.

The low value of the currency and the cheapness of mining compared with the costs in other European mining districts would have led to a considerable increase in Poland's output of coal had it not been for the embargo placed by Germany on Polish coal. This checked the export to South-east Germany, and the total export fell from 12,500,000 tons in 1923 to 8,000,000 tons in 1925. In 1926, however, Germany and Poland came to a temporary agreement, and while British coal was absent from European markets Poland's exports increased. The proportion of coal available for export is increasing, and in 1929 nearly 14,500,000 tons

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were exported, chiefly to Austria, Sweden, the Baltic states, Denmark, and France.

Iron

Poland's iron ores are very limited, the chief mines being at Bogucice, Chorzów, Tarnowski Góry, and Częstochowa, in the south-west, and high-grade ore is imported from

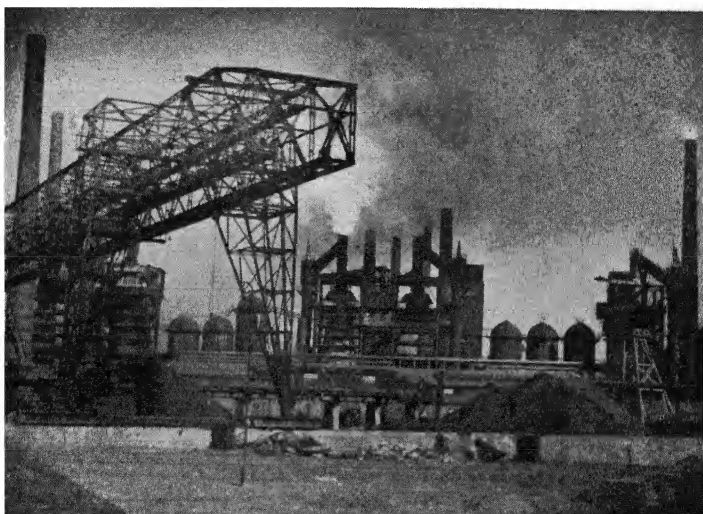


FIG. 114. BLAST-FURNACES IN POLISH UPPER SILESIA

Heaps of Swedish iron ore in foreground.

By courtesy of the Polish Press Bureau

Sweden, and in the steel-works the open-hearth process is used, and large quantities of scrap iron are required. As this is an expensive process the tendency is for the steel industry to specialize in the production of finished articles. The total output of steel seldom exceeds 1,000,000 tons, but Poland is now able to produce all the steel rails, plates, and bars required for domestic use, while its locomotive-works at Chrzanów make railway engines patterned on those sent out from Britain at the close of the World War. The chief steel

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and galvanizing works are at Katowice and Królewska Huta. Machinery is made at Sosnowiec, Dąbrowa, Częstochowa, and Kielce, but the smaller metal industries are not localized near the coalfields. Steel pipes for hydro-electric power-stations are manufactured near Kielce for export to all parts of the world.

Zinc

Zinc ores are found in limestone beds lying to the north-east of the Upper Silesian coalfield, in the neighbourhood of Tarnowski Góry (Tarnowitz), where the principal refineries are found. In this neighbourhood the ores are rich (blende 20 per cent. and calamine 14 per cent. zinc), but because they lie near the surface they have been nearly exhausted. Within the old Russian frontier mining is still carried on at Będzin and Olkusz, the latter possessing zinc-foundries. In what was formerly Austrian Poland zinc is mined at Jadwiga, coal being obtained from Upper Silesia and Kraków. Zinc ore is also imported from Carinthia. The output of the zinc industries of Germany and Poland has fallen greatly since 1913, when 30 per cent. of the world's zinc was manufactured in Upper Silesia.

ANNUAL PRODUCTION OF ZINC METAL IN THOUSANDS OF TONS

Country	Pre-War (1913)	Post-War (1928)
World	1001	1066
United States	320	546
Belgium	204	209
Poland	192	170
Germany (Upper Silesia) . . .	112	41
Poland's percentage of world output	19.2	9.3 (in 1929 10½ per cent.)

The metal (spelter)—44,000 tons in 1928—is exported to Germany, Czecho-Slovakia, and Britain, while the galvanized iron is sent to Germany, Japan, Denmark, and Austria. All

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the zinc-works and 82 per cent. of the zinc ore mined are now Polish. The capacity of the refineries of lead and zinc is much greater than is needed to refine the Polish ores, and large quantities are imported—zinc from Germany, Spain, and Australia. Sulphuric acid is an important by-product of the Upper Silesian zinc-lead industry.

Salt

Rock-salt is obtained from Triassic deposits at Wieliczka, Bochnia, Inowrocław, and Wapno, and brine is evaporated at Ciechocinek. In 1926 the output was 457,000 tons, 67 per cent. being used for human consumption, 31 per cent. in industry, and 2 per cent. for cattle.

Potassium salts, similar to those of Stassfurt, are known to exist in Poznań, and as they are expected to cover a very large area borings are being made near Wapno. In the Eastern Carpathians mining has been carried on for some time at Kałusz and Stebnik. In 1926 the amount of potash salts produced was 207,000 tons (*cf.* Germany 1,600,000 tons). There appears to be a great future for the development of the potash industry in Poland, which is generally underfertilized. Up till recently the crude salts were exported to Czecho-Slovakia, Rumania, Sweden, and Denmark, but with the completion of the refinery at Kałusz it is expected that increasing quantities will be consumed within the Polish boundaries.

Petroleum

The Polish oilfields lie chiefly to the south-west of Lwów (Lemberg), in a belt of Tertiary deposits, which varies in width from forty to sixty miles for a distance of 200 miles along the flanks of the Northern Carpathians. In 1909 the output of crude oil was about 2,000,000 tons, but from that time there was a gradual falling off till 1921, when there was a slight recovery. It has been estimated that 30,000,000 tons out of the total reserve of 160,000,000 tons have already been extracted in the 500 shallow wells of the existing oilfields, but it is possible that the Standard Oil Company of

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the United States, which is making deep borings (5000 feet) a few miles south of Borysław, may reach a more profitable oil-bearing zone. The first new well, completed at a cost of nearly £30,000, paid for itself in forty-five days.

The chief oilfields are at Kraków, Jasło, Drohobycz, and Stanisławów.

1. The *Kraków oilfield* (output 5000 tons) is the most recent and least developed. It contains very light oil at a depth of about 2000 feet. The chief centres are Pisarzowa and Mordarka, refineries in the Bielsko district, near Kraków.

2. The *Jasło oilfield* (output 51,000 tons) lies to the south of Kraków, and has crude-oil deposits at about 350 feet below the surface. Refineries at Jasło, Krosno, and Stróże.

3. The *Drohobycz oilfield* (output 690,000 tons) includes Nowy Sącz and Limanova, the districts of Borysław, Truskawiec (Tustanowice), and Mrazńica, which produce over three-quarters of the total oil output of Poland. The surface wells of Borysław are practically exhausted. A large proportion of the output of this district now comes from deeper wells (3000–5000 feet) in the Schodnica district.

Of the thirty-four Polish refineries the largest is the State refinery at Drohobycz, which has a capacity of 250,000 tons per annum, about one-third of the total output of Poland.

4. The *Stanisławów oilfield* (output 24,000 tons), on the south-east of Drohobycz, links the Polish and Rumanian oilfields. The largest number of wells lie in the Bitków district, but the whole of the area has not been fully explored. The oil at present produced contains a large proportion of benzene. The State oilfields lie chiefly to the south-east of Stanisławów. There are ozokerite-mines near Dzwiniacz and Starunia. Crude oil, similar to that of Borysław, is also found in the same district.

As the present total output of Polish oil is less than half that of 1909 a very large proportion is refined, and there is practically no export of crude oil. In 1924 the output of the oil-wells was 771,000 metric tons of crude oil and 138,000,000 cubic metres of natural gas, and 405,000 metric tons of oil products were exported to Czecho-Slovakia (114,000 tons),

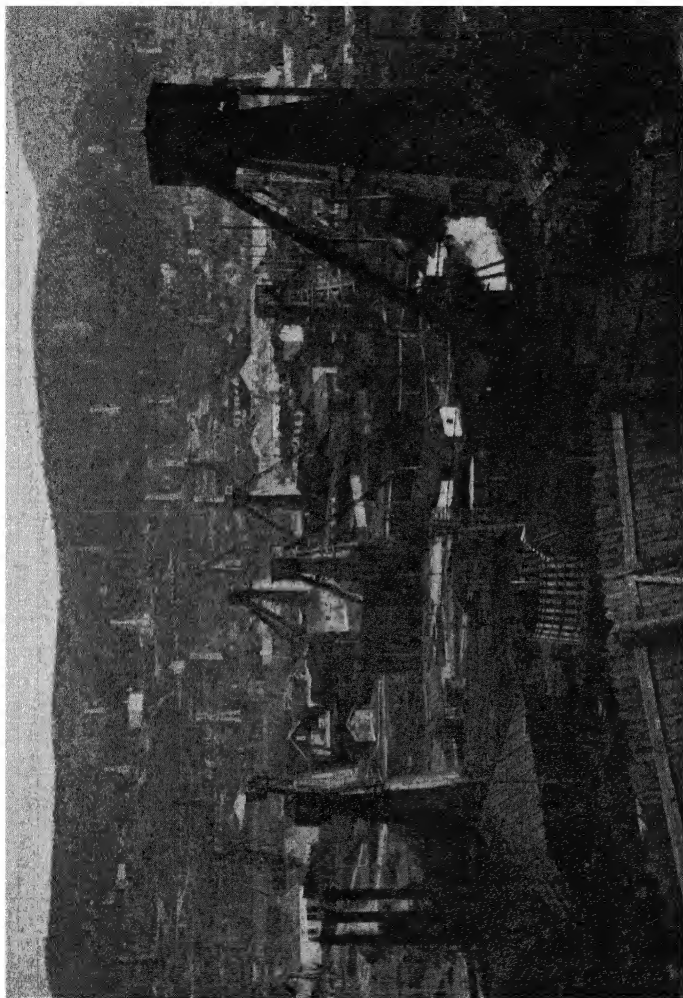


FIG. 115. THE OIL-WELLS AT BORYSLAW
By courtesy of the Polish Press Bureau

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Germany (104,000 tons), Danzig (59,000 tons), Austria (53,000 tons), Hungary (18,000 tons), and Switzerland (15,000 tons). The refined products are crude oil (197,000 tons), lubricating oils (119,000 tons), gasoline (113,000 tons), benzene (91,000), and paraffin (34,000 tons). The crude oil is largely consumed in Poland, and a large proportion of the refined products is exported. The exports amount to two-thirds of the total output, small quantities finding their way to Britain, France, Finland, and Denmark.

Manufactures

Poland is a singularly rich and self-contained country. With the exception of cotton, silk, rubber, and copper, it requires few imported raw materials. Its resources are sufficient to ensure its becoming a manufacturing nation provided its financial stability can be maintained. As more than four-fifths of the Poles own some of the land they cultivate the principal industries are concerned with the products of the farms and forests. In the centre and west the sugar industry is highly organized, barefooted peasants of both sexes working in the fields in summer and in the refineries in winter for an average wage of little more than a shilling a day. Sugar is usually the most valuable export after coal, with timber shipped from Danzig and Gdynia the third. Timber industries are generally confined to the neighbourhood of navigable rivers. There are a number of paper-mills, and at Hajnówka 300 miles of narrow-gauge railways centre in the world's largest wood-alcohol distilling-plant.

Linen and woollen manufactures dating from the thirteenth century supply the home market, but with the introduction of power-looms during the nineteenth century the Bielsko-Biała district has specialized in high-grade cloths for export to the Near East. During the War the mills of Cieszyn were the only ones to remain undamaged, but those of Biała and Jablinków have been restored, while the output of Białystok, in the north-east, has almost reached pre-War proportions. Jute is manufactured on a small scale at Częstochowa, while silk is used in the clothing and embroidery

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industries of Warsaw, Białystok, Tomaszów, Mysłów, and Kałusz. Linen is made at Żyrardów, in the neighbourhood of Lwów, and near Warsaw, but the greatest centre for textiles is Łódź, which produces more than four-fifths of Poland's output of cloth.

The development of cotton manufactures at Łódź and its satellite towns—Pabjanice, Ozorków, Zdunska Wola, Zgierz,

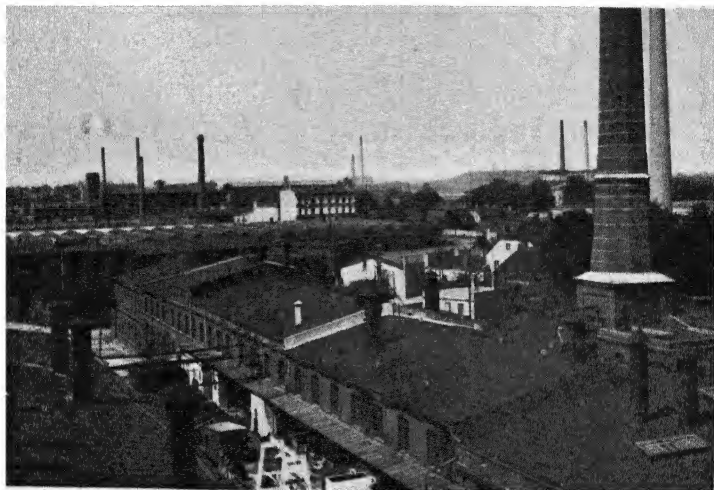


FIG. 110. COTTON-MILLS AT ŁÓDŹ, THE MANCHESTER OF POLAND

By courtesy of the Polish Press Bureau

Tomaszów, and Żyrardów—was due to the enterprise of French and German managers, who established the first factories and equipped them with power machinery a hundred years ago. The young industry was fostered by protective tariffs, and in spite of the dryness of the atmosphere, the freezing of the rivers, the distance from raw materials, and the competition of the factories of Warsaw and Leningrad, Łódź dominated the Russian market. Being compelled to use the lower grades of Russian cotton, Łódź specialized in low-grade cloths, which were marketed throughout Russia, Persia, and Western China. Many of the Polish factories

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were destroyed during the World War, and afterward imported raw materials had to be bought with a much depreciated currency. Though the old export markets have been lost the present output of cotton cloth exceeds that of 1913, and Polish cloth has begun to displace that of Russia throughout the Balkans and the Near East, and even to a certain extent in Persia and China. Łódź has resumed its position as one of the greatest cotton centres in Continental Europe. Of the 1,500,000 textile workers in Poland Łódź contains one-third, and its mills are equipped with modern German machinery, capable of utilizing both Russian and Egyptian cotton. Cotton and wool are the principal Polish imports.

Poland consumes increasing quantities of chemicals in textile and tanning industries and in agriculture. Super-phosphates are produced in the steel-works, and from imported phosphorites, though there are low-grade deposits of the latter in the Dniester and Vistula valleys. The potash-mines of Kałusz and Stebnik produce about 75,000 tons of kainite annually, and at Chorzów cyanogen, carbide, and artificial nitrates are produced in large quantities.

Poland is not yet industrialized to a great extent, and this allows a very considerable export of raw materials and foodstuffs, such as coal, timber, zinc, sugar, mineral oil, and grain. The low exchange value of its currency is due in part to its great military expenditure, which rivals that of France and Russia. Low wage rates enable Polish coal to displace that of Britain in the Baltic and Scandinavian countries, and the closing of the British coal-mines in 1926 brought Polish coal into Britain itself. Since 1924 the value of the timber exports has increased by 75 per cent., the increase being chiefly in 'round timber.' Half the export trade of Poland consists of agricultural products, and recently there has been an increase in products of animal origin. The export of grain has decreased, but it must not be assumed that Poland has ceased to be a grain-exporter. Agriculture remains the key industry, but the present tendency is for its agricultural exports to be sent out in the finished state. Nearly one-fifth of Poland's foreign trade passes through Danzig, but there is also an export of coal along the Oder

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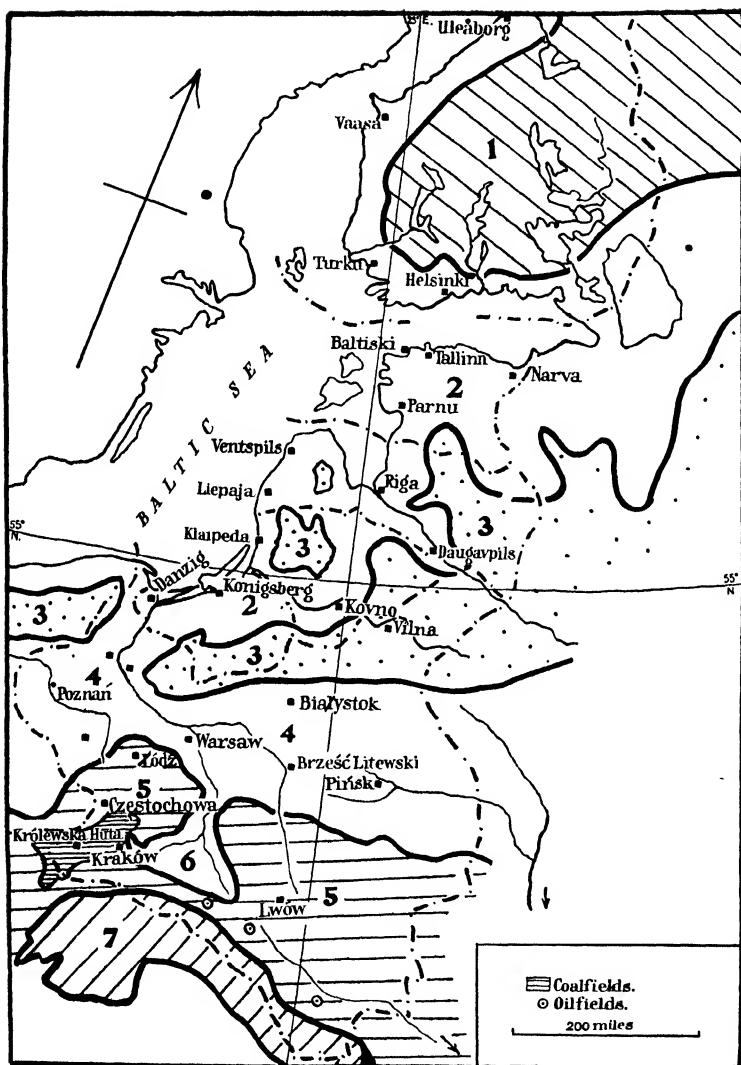


FIG. 117. PHYSICAL REGIONS OF THE BALTIC STATES

- 1, Finnish plateau; 2, Baltic coast; 3, Baltic heights; 4, central valleys; 5, southern plateaux; 6, Galician depression; 7, Carpathian Mountains

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valley to Germany, of oil and Swedish iron ore to Czechoslovakia, and of manufactured goods to Russia.

Physical Regions

Though four-fifths of Poland lies below the 600-foot contour, there is, nevertheless, a considerable variety in the surface relief. As the great ice sheet stretched as far south as the Podolian plateau, the underlying structure hardly affects the landscape, which has been determined almost everywhere by glaciation.

1. The Baltic Plain. The Baltic plain lies within 150 feet of sea-level, and the soil consists of alluvial and glacial soils, except in the west of the mouth of the Vistula, where Tertiary soils outcrop in the Pomeranian heathlands on the west of Danzig. The only part of the Baltic plain lying within the Polish frontier is the portion of the Polish corridor which lies immediately to the west and north-west of Danzig. On the coast the only town is the new national port of Gdynia, but along the Vistula there are two important centres, Grudziądz, or Graudenz (53,000 inhabitants), and Bydgoszcz, or Bromberg (119,000 inhabitants). The latter originated at the bend of the Vistula at what was virtually the limit of seagoing navigation. Its canal gives water communications with the Oder, while its rail and river facilities make it the chief cattle and timber market of Pomerania. The completion of the projected Gdynia-Bydgoszcz-Katowice railway should greatly increase its industrial importance. Grudziądz has developed leather, rubber, and pottery industries and manufactures agricultural machinery. The ancient fortress of Toruń (50,000 inhabitants), built on a cliff on the right bank of the Vistula, was formerly the chief town of Pomerania, but no longer commands the transit trade between East Prussia and Poznań.

2. The Baltic Ridges. These rise to a height of about 1000 feet in the Pomeranian ridge near Turmberg and in the Tannenburg and Seesterburg districts of the Prussian ridge, which lies to the east. Between the Prussian and Pomeranian heights lies the Vistula depression, which connects the Baltic

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plain with the great lowlands of Central Poland. The morainic soils of the ridges are poor and unproductive, and because of the general upland character of the districts spring and autumn temperatures are too low for any cereal except rye, and even this is only grown on a small scale. Though a great deal of the highland belongs to Prussia part of the Pomeranian ridge lies within Poland, and is characterized by timber

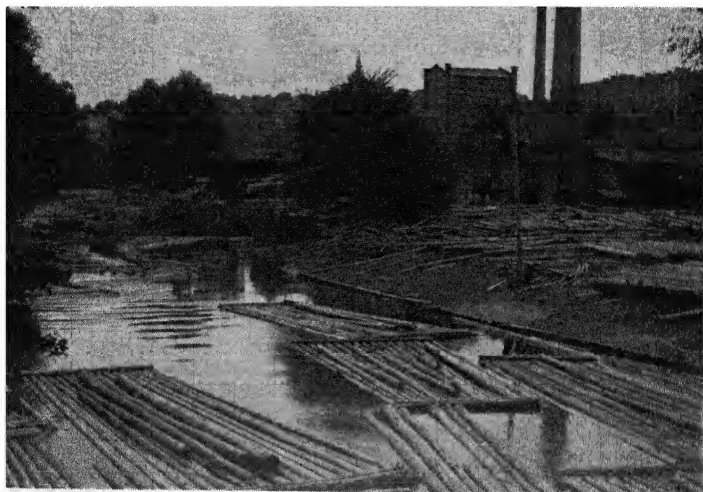


FIG. 118. TIMBER-RAFTING AT BYDGOSZCZ

By courtesy of the Polish Press Bureau

industries. In the Pomerellen district there is a certain amount of water-power, which has been utilized in the saw-mills which lie between Toruń and the Baltic coast. The hydro-electric station at Kartuzy supplies power to Danzig and Gdynia.

In the north-east of Poland the Suwałki and Vilna districts lie within the Polish frontier, and Wilno, or Vilna (201,000 inhabitants), is the chief town of Lithuanian Poland, at the junction of railways from Leningrad, Warsaw, Libau, and Moscow. Formerly the chief inland market of Lithuanian timber, cattle, flax, and wool, Vilna's large population is

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due to its being one of the few towns in Russia where Jews were tolerated.

3. **The Central Plains.** The greater part of the basins of the Pripet and the Vistula is an almost level plain which rises gradually from about 200 feet in the districts which lie to the north-west of Warsaw to about 400 feet above sea-level in the low watershed which separates the drainage of the Pripet and the Vistula. In the district which lies between Białystok, Minsk, and Vilna the plains rise into low hills of about 500 feet along the Russian frontier, a somewhat desolate region of poor cultivation. The western portion of the plain in Poznań and Warsaw—"the Mazovian plain"—is more fertile and better cultivated than the eastern area—"the Podlesian plain"—along the Bug and Pripet, where large marshes still remain.

The whole of the lowlands is a region of great valleys which give easy communication between Germany and Russia as well as between the Baltic and the upland regions of South Poland. The valleys of the present-day tributaries as well as those of the main streams are extremely broad on account of the great amount of water that was carried by the great east-west rivers which drained the North European plain when the outlets to the Baltic were blocked by the great ice-sheet. These ancient valleys cut across the modern north-south rivers and make the construction of railways and canals between east and west easy. Unfortunately the three-fold division of Poland made the construction of large canals and through trunk railways impossible before 1918. The German and Russian railways had different gauges, and the Russian waterways were much neglected. Moreover, the Pripet headstreams were left undrained and unregulated in order to provide Russia with a line of defence against Germany. Brześć-Litewski (30,000 inhabitants) and Pińsk (20,000 inhabitants) command the routes through the Pripet marshes to Russia. They are small agricultural and timber markets, the latter building boats.

There are two large towns in the central plain—Warsaw (1,109,000 inhabitants) and Poznań (248,000 inhabitants). Like many other towns of the European plain, Warsaw grew

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up round a castle built on an easily defended hill near the junction of several valley routes. Near it the Vistula changes direction, while important roads converge on it from Lenin-grad, Danzig, Breslau, and Kiev. The capital of the Mazovian duchy, and later of Poland, it became the chief centre of the annual fairs in hops and wool and the chief agricultural and manufacturing centre, its engineering, textile, and glass in-



FIG. 119. FIELD OF BARLEY IN POZNAŃ

By courtesy of the Polish Press Bureau

dustries being especially important. Poznań, the market of the grain-growing district of Western Poland, formerly sent large quantities of wheat and oats to Germany, Bohemia, Scandinavia, Holland, and Finland, while its fat cattle found a market in Berlin and Breslau.

4. **The Polish Plateaux.** The greater part of Southern Poland consists of plateaux which sometimes rise more than 1000 feet above sea-level. The plateaux are divided into two distinct parts by the Vistula, which below its confluence with the San breaks through the uplands between Kielce

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and Lublin. Although there is no more than the narrow valley of the Vistula between them the south-western plateau of Silesia, Kraków, and Kielce differs in many respects from the south-eastern of Lublin, Volhynia, and Podolia.

(a) The *south-western plateau* consists of Jurassic rocks which are continuous from Upper Silesia to Łysa Góry, in the Kielce district, which rises to nearly 2000 feet above sea-level. The average elevation, however, on the west of the Vistula is about 900 feet, and the southern slopes are generally fertile, being covered with loess. It is to its minerals, however, that the south-western plateau owes its importance, coal being found in Upper Silesia, with zinc and lead, and in the Dąbrowa and Kraków districts. A quarter of the people of Poland dwell in towns, and these are most numerous in the south-west, where the population is densest. Łódź (606,000 inhabitants) is the great centre of the textile industries, Sosnowiec (103,000 inhabitants), in the Dąbrowa coalfield, has coal, engineering, and woollen industries. Radom (62,000 inhabitants) manufactures leather, while Kielce (43,000 inhabitants) uses local coal in its metallurgical industry. Częstochowa (115,000 inhabitants), a fourteenth-century monastery which became an important pilgrimage centre, owed its commercial and industrial development to its command of the transit trade to Silesia. Dąbrowa (41,000 inhabitants), Bedzin (28,000 inhabitants), Katowice (45,000 inhabitants), Królewska Huta (90,000 inhabitants), Rybnik, and Pless are the principal coal and iron centres of Poland.

(b) The *south-eastern* or *Podolian plateau*, lying to the east of the wooded terraces of the Vistula valley, extends through Lublin and Rovno toward Kiev and south-eastward toward the heights of Lwów, toward the Bug and Dniester valleys of the Ukraine and Rumania. Unlike the south-western plateau, that of the south-east possesses no important minerals. In fact, the underlying rocks form part of the great palæozoic region known as the Russian platform. Nevertheless, the surface soils of loess and fine silt (*cf.* 'limoneuse' Flanders) are extremely fertile, the great

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black-earth wheat belt of Eurasia beginning at Hrubieszów and Chełm, in the valley of the Polish Bug, stretching throughout Southern Russia as far as the northern flanks of the Altai, in Siberia. As the summer temperatures are higher than in Northern Poland, cereals, particularly oats, rye, and wheat, are cultivated on a large scale, though less machinery is used than is the case in North America. Sugar



FIG. 120. INTERIOR OF A POLISH COTTAGE AT ŁOWICZ

Peasant arts exist everywhere in Poland, and many of the country people still make their own clothes and domestic utensils.

By courtesy of the Polish Press Bureau

and hops are cultivated for export. **Lwów** (240,000 inhabitants) commands the old trade-route from Kiev to Kraków and Silesia. A great centre of Jewish traders, it retains its annual fairs and is the business centre of South-east Poland. **Lublin** (119,000 inhabitants), the grain, sugar, and tobacco market of Podolia, manufactures agricultural machinery.

5. The Galician Depression. This stretches along the Upper Vistula, San, and Dniester valleys at the foot of the Carpathian Mountains. Here the land is seldom more than 800 feet above sea-level, and forms a broad trough which

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carries the main routes from Rumania and the Ukraine to Silesia and Czecho-Slovakia. The principal towns lie at points which command passes across the mountains. At Kraków the Galician plain begins and extends eastward to the San, forming a triangle of low-lying country, of which the other points are Sandomierz, near the junction of the Vistula and the San, and the town of Przemyśl. Kraków



FIG. 121. THE CARPATHIANS: THE TATRA NEAR ZAKOPANE

By courtesy of the Polish Press Bureau

(210,000 inhabitants), the head of barge navigation on the Vistula, commands the great eastern route to Kiev and a gap in the Carpathian Mountains. Like Vienna, it was a rallying-point against the Mongol invaders. Its local supplies of salt gave it an early commercial significance, which has now declined; it remains the centre of an important mining and manufacturing district. Przemyśl (48,000 inhabitants) and Cieszyn (Tescheń) occupy defensive situations at the outlet of Carpathian valleys, but are of little value in trade, because of the absence of transit trade across the mountains.

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6. **The Carpathian Mountains.** The Carpathian Mountains consist of two parallel chains, the more northerly of which forms the southern frontier of Poland, except in the High Tatra, which is part of the Inner Carpathians. Except in the Tatra, the greater part of the ranges consists of wooded sandstone country, but in the south-west the Western Beskids contain the picturesque limestone outcrop known as the Carpathian Cliffs, which are not forested.



FIG. 122. A POLISH VILLAGE IN WAR-TIME

A very large number of Polish villages were completely destroyed during the World War.

By courtesy of the Polish Press Bureau

The granite core of the Tatra averages 6500 feet above sea-level, but rises in places to 8500 feet, the highest peaks in the Carpathians. The forests of its slopes end at about 5000 feet above sea-level. In the absence of good communications the development of the Carpathian region is confined to forest and pastoral industries, though the existence of water-power, and especially of natural reservoirs in the glacial lakes, show that hydro-electric manufactures could be developed. The only minerals of importance are salt and petroleum. Rock-salt is mined in the foothills in

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the neighbourhood of Wieliczka and Bochnia, and potassium salts at Kałusz and Stebnik. The petroleum-wells lie to the south-east of Przemyśl, in Borysław and Truskawiec (Tustanowice), in anticlines of Tertiary age. Given peaceful conditions, there is no reason why the Carpathians should not eventually become as important industrially as the more easterly parts of the Alpine folds.

DANZIG

The Free State of Danzig covers about 754 square miles of the country which lies between the Nogat river and the foothills of Pomerania. The streams of the latter supply fresh water to the city of Danzig (407,000 inhabitants), which occupies an intermediate position between Eastern and Western Europe and between the Vistula basin and the Baltic Sea. It is not the desire of its German inhabitants, but its border character, that has given to it its unique international status. It became important in the early part of the thirteenth century, when German merchants and artisans settled there. A leading centre of the Hanseatic League, and protected from Polish aggression by the powerful Order of Teutonic Knights, it found itself the chief port of the Christian states of Western Europe after the fall of Constantinople, and it retained its importance after the decline of the Hansa and the collapse of the Teutonic Knights. In the sixteenth and seventeenth centuries Danzig ranked with Amsterdam as one of the world's great ports, with a large export trade of grain and timber from Poland, Prussia, and even from Russia. In the eighteenth century Poland collapsed, and Danzig became part of Prussia. It lost its Polish hinterland, and after the fall of Napoleon, who used it as an arsenal in his campaign, relapsed into the position of a prominent market of Prussia.

During the first half of the nineteenth century the countries of Western Europe began to purchase grain and timber from North America, while Russia directed her exports through her ports on the Black and Baltic Seas, so that Danzig lost more and more its character of a middleman in

DANZIG

the trade between East and West. With the development of railways, however, Danzig became an *entrepôt* and transit centre for rail-borne traffic between East and West. Herrings and German manufactures were exchanged here for Russian sugar and grain, and a number of local industries arose to serve the transit trade. The goods which found a market in Danzig were often of considerable value. The Treaty of Versailles put an end to Danzig's position as the outlet of East and West Prussia, and as it was the only sea-port serving Poland it was denationalized, though more than nine-tenths of its inhabitants were German. It was placed under the protection of the League of Nations, but, being separated from its former hinterland, its trade was paralysed, and it suffered greatly from the purchasing incapacity of the new Polish state. The import trade especially was hard hit by the instability of the Polish currency.

Before the World War there was an approximate balance between imports and exports, but at the present day Danzig is chiefly an export port for timber, coal, and grain (barley). Before the War it imported coal and exported large quantities of grain and sugar. The amounts of grain and sugar exported are still considerable, and Danzig has displaced Stettin as the export port for Upper Silesian coal. It is chiefly important, however, for its timber exports (1,000,000 tons), and it has become the import port for the Swedish iron ore used in the Polish furnaces.

TOTAL TRADE OF DANZIG IN TONS

Year	Imports	Exports
1913 . .	1,233,630	878,471
1926 . .	640,696	5,659,605

In response to this change from a general merchandise to a bulk cargo export port its harbour has been enlarged, but competition will soon be felt from the new Polish port of Gdynia, to the north. In 1929 2,498,000 tons of cargo were exported from the new Polish port.

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In consequence of its political severance from Germany and of the existence of high Polish tariffs, there is now no considerable market for Danzig's manufactures. Two changes are needed to restore Danzig's industrial and commercial greatness. (i) Its goods must be free to enter Germany, Poland, and Russia unhampered by excessive tariffs, and there must be an equally free return movement of Russian

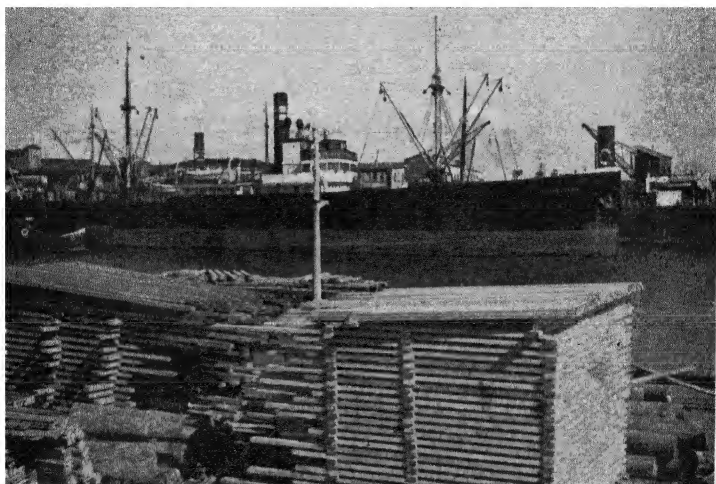


FIG. 123. TIMBER DOCKS AT THE NEW POLISH PORT OF GDYNIA

By courtesy of the Polish Press Bureau

grain, Polish timber and coal, and German (East Prussian) cattle. It would form an excellent centre for the export of goods usually kept in cold storage. (ii) The Vistula must be made navigable into the heart of Poland (see page 612). The Elbe is navigable to Prague and the Oder to Kosel, but the Vistula is navigable only as far as Toruń (Thorn). All pre-War efforts to obtain Russian co-operation in improving the navigation failed, and this, combined with the existence of high tariffs, deflected much of the traffic in grain and timber to Odessa, Riga, and Trieste. Geographically the hinterland of Danzig includes parts of Hungary, Austria, 620

DANZIG

and the Ukraine, and any considerable improvement in its industries can come to pass only in response to more settled conditions in the political and economic life of Eastern Europe. Being within the customs union of Poland, Danzig has been forced to adapt its industry, agriculture, and commerce to a market which, till quite recently, lacked a stable currency. The shipyards of Danzig are able to build vessels of 35,000 tons, but at the present time the shipyards cannot be used to their full capacity.

The largest trade is done with Britain (timber and sugar), Sweden (coal and ores), and Germany (grain and petroleum). Moreover, a direct outlet is provided for Polish emigration, nearly 115,000 persons passing through the port in 1923. As regards the total tonnage dealt with, Danzig is in an extremely favourable position.

TOTAL SEA-BORNE TRAFFIC OF THE BALTIC PORTS IN TONS¹

Port	1913	1928
Danzig . . .	2,112,000	8,616,000
Stettin . . .	6,245,000	4,597,000
Riga	4,033,000	1,746,000
Leningrad . .	6,661,000	1,717,000
Königsberg . .	1,870,000	1,646,000
Tallinn (Reval) .	956,000	700,000
Klaipeda (Memel)	—	350,000

The chief imports are scrap iron and iron ore, fertilizers, salted herrings, tobacco, colonial products, and German and English manufactures. Of the 6,783,000 tons exported four-fifths consisted of coal and 13½ per cent. of timber, the remainder being made up of sugar, cement, grain, and petroleum products. Since 1926, when the British coal-mines were idle, Danzig has become the chief coal-port of Poland, and the Swedish importers now consider Polish coal to be equally as good as that previously obtained from South Yorkshire and Northumberland. Polish coal is in increasing

¹ Compare the Scandinavian ports: Copenhagen, 5,200,000 ; Göteborg, 4,400,000 ; Stockholm, 4,300,000 ; and Malmö, 2,600,000.

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demand, and this has stimulated the attempt to build a purely Polish port. This port, Gdynia, has grown rapidly, its exports increasing from 896,000 tons in 1926 to nearly 3,000,000 tons in 1929.

Less than 50,000 of the people of the Free State live outside the city, and the only town of any size is the western part of Marienburg, a small fortress-port on the Nogat. The partition of this town has hampered the timber, sugar, flax, and brandy industries. Throughout the Vistula delta the rich alluvial soil produces fine crops of wheat and sugar-beet, while cattle and horses are bred on the farms. The Teutonic Knights brought the water of the little Radaune river to Danzig to work the great corn-mill, and modern hydro-electric plants on this river now produce nearly 10,000 horse-power, though the total fall is less than 300 feet.

LITHUANIA

The medieval dukedom of Lithuania occupied the basin of the Niemen, and was separated from Russia, Poland, and Prussia by swamps and forests. The isolation of this area enabled the ancient Lithuanian tongue, which is closely allied to Sanskrit, and is unlike any other European language, to be preserved. Prussia was conquered by the Teutonic Knights, and in the fifteenth century Lithuania was united to Poland, being annexed by Russia in 1795. It retained its nationality, however, throughout the Russian occupation. When in 1920 Russia acknowledged its independence Lithuania included the provinces of Vilna, Grodno, Suwalki, and Kovno, but Poland seized Vilna and Grodno, thus separating the remainder of the old duchy from its natural hinterland in Russia. From 1920 till late in 1927 a nominal state of war existed between Lithuania and Poland. Danger of Polish attack, and fear that their newly acquired small-holdings might be taken from them and given to the big Polish landowners, have given the Lithuanian peasants a strong sense of nationality. Moreover, they have received moral support from both Germany and Russia. Of course,

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it would be impossible for the little Lithuanian volunteer army to withstand a military attack by Poland, and it is also probable that Lithuania will be unable to stand alone as an economic unit. Already the desirability of closer co-operation among the coastal states of the Baltic has led to commercial treaties with Latvia and Estonia, but, as in the case of the other Baltic states, it is of vital importance that the transit trade between Russia and Poland on the one hand and the Baltic ports on the other should be reopened.

The Polish and Lithuanian struggle is an interesting example of the difference between ethnographic and linguistic frontiers. Lithuania claims Vilna because it was the capital of the old Grand Duchy of Lithuania. Poland claims it because it contains more Poles and Jews than Lithuanians. Actually the majority of the peasants are White Ruthenes, who stand ethnographically between the Poles and the Russians.

A more serious objection to Poland's possession of Vilna lies in the fact that the Niemen valley provides direct access between Lithuania and Russia, and the loss of 1,500,000 inhabitants and two-fifths of its territory imposes a great handicap on Lithuanian development. Moreover, the great railway routes meet at Vilna, and the little Lithuanian republic is cut off from direct intercourse by railway with both Warsaw and Moscow.

Physical Sub-regions

1. The **Baltic coast** consists of the northern portion of the Kurisches Haff, famous through the ages as the Amber Coast, and a short stretch of the mainland coast near Klaipeda (Memel). This coast-land is similar to that of Poland and Germany, and produces rye, oats, wheat, potatoes, sugar-beet, and fodder crops. Flax is rapidly increasing, being grown both for seed and for fibre.

2. The **Baltic uplands** comprise three groups: (a) the Zhemait district, which lies between the Neviazha plain and the coast near Klaipeda and possesses numerous deep lakes drained by swift and shallow streams, (b) the high Suwalki upland, which forms the southern boundary and contains

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the Mazurian lakes, and (c) the low upland of Yezhereno-Svencionys, containing numerous lakes from which rise the head-streams of the tributaries of the Niemen.

3. The inland plain of the Niemen, Viliya, and Neviazha, which forms the chief agricultural and cattle-breeding area, and whose rivers provide water-transport for timber.

Nearly half of free Lithuania is arable, a quarter is meadowland, one-fifth is forested, and 4 per cent. is water. In the lower parts the annual rainfall is less than twenty-five inches, while the temperature ranges from 20° F. to 68° F. Before the War Lithuania exported more than 100,000 tons of grain and flour. This has been much reduced in consequence of the breaking up of the large estates into pastoral smallholdings. The reckless destruction of timber during the War has also tended to increase the area under pasture, and there is an increasing export of dairy produce, meat, and eggs. As in the other Baltic states, the breaking up of the large estates has led to more intensive cultivation, and the post-War reorganization of the co-operative cattle and dairy societies has led to a remarkable increase in stock-raising.

The Lithuanian forests consist chiefly of firs and pines, and before the War lumber was the principal export. Königsberg, near the Niemen mouth, was the chief outlet (see page 393), and the 3,000,000 tons of timber rafted down from White Russia supported a large sawmilling industry in East Prussia. Since the War the export of lumber has decreased, a large proportion of timber cut in Lithuania being needed in the domestic wood-working industries. A resumption of the rafting trade of the Niemen would benefit both Lithuania and East Prussia.

There are only three towns of any importance—Kaunas, or Kovno (96,000 inhabitants), where the Königsberg-Vilna railway crosses the Niemen, is the present capital, and is being equipped with grain elevators. It is the chief grain and cattle market, and possesses small agricultural industries. Klaipeda, or Memel (36,000 inhabitants), is an ice-free port possessing a shipyard, sawmills, and celluloid-works. It is the one sea-port. Unfortunately it has no direct communications with its hinterland. Shavli, or Siauliai (23,000

LATVIA

inhabitants), in the north, is connected by rail with Liepaja, Riga, and Daugavpils, in Latvia.

LATVIA

Latvia is little larger than Lithuania, and consists of the immediate hinterland of the ports of Riga, Ventspils (Windau), and Liepaja (Libau), together with the country round Daugavpils (Dvinsk), on the Dwina. The lower basin of the Dwina lies at a much lower elevation than the river valleys of East Prussia and Lithuania, and consequently a larger proportion of the country can be utilized. Twenty-nine per cent. of the area is forested, 28 per cent. is arable, 27 per cent. is under pasture, and the remainder is waste.

The greater part of the population is of Nordic origin, and German, Russian, and Swedish settlers have been assimilated successfully. The only people of Fenno-Ugric origin are the Livonians, who speak a language resembling that of Estonia. The Livs, who entered Latvia in search of more lucrative fishing-grounds, have been absorbed, except in North Courland (Kurzeme). Before the eighteenth century Latvia had been occupied by German, Polish, and Swedish invaders, the latter carrying on an enlightened policy toward the natives, and even contemplating the liberation of the serfs. Swedish rule ended in 1721, and for two centuries Latvia formed part of Russia, with the result that practically the whole of the land passed into the possession of the big estate owners. The landless condition of the peasantry gave rise to anti-Russian feeling, and the World War created a feeling of nationality. With the weakening of the military power of Germany and Russia the Latvian peasant army seized the land and subdivided the large estates.

Physical Sub-regions

The physical subdivisions are similar to those of Lithuania.

1. The **coastal lowland** consists of a narrow strip in the neighbourhood of Liepaja, and broadens out into a large area of fertile lowland along the shores of the Gulf of Riga. Here oats, barley, rye, and potatoes are the staple crops, and

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the coastal plains form the principal cattle-rearing district, co-operative dairying being well developed in the north-east, and especially in Riga (378,000 inhabitants), the capital, which is the lowest bridge-town of the Daugava (Dwina). Founded by Hansa merchants in the twelfth century, it developed into the most important port in Russia, and became the chief import port for raw cotton, machinery, coal, wine, and fruit. Its exports of butter, eggs, flax, hemp, linseed, hides, and cereals were chiefly derived from what is now the U.S.S.R. A small shipbuilding industry was carried on at Dünamunde, the naval port, and iron goods, cotton yarns, pulp, porcelain, and rubber were manufactured. Being the chief market for the timber of White Russia and Volhynia, it specialized in the making of railway sleepers. Its principal imports are coal, cork, dyes, iron machinery, coffee, cottons, woollens, fruit, herrings, tobacco, jute, tea, wines, and spirits.

The pre-War tonnage of its port was 4,000,000. The volume of Riga's overseas trade is now much less, and the total amount of transit trade from Russia is little more than 500,000 tons. During the World War and the blockade a great part of the machinery used in the textile, woodworking, and engineering industries was scrapped, and as Latvia had never been completely Russianized the new tariff frontier brought the export industries of Riga to a standstill. At the present time the manufacture and export of cotton and linen yarn has been re-established, but the timber exports remain below the pre-War level. At Riga the Daugava is half a mile wide, and the fresh water of the shallow gulf freezes for nearly five months every year. Navigation can be maintained till December only by employing ice-breakers. Liepaja, or Libau (57,000 inhabitants), and Ventspils, or Windau (17,000 inhabitants), were originally small fishing villages, but as they are practically ice-free they have become outports for Riga's transit trade from Russia for the export of local timber, grain, and eggs, and for the import of coal and dairy produce.

2. The **Kurzeme (Courland hill country)** is a continuation of the Baltic coastal ridge already noted in East Prussia

LATVIA

and Lithuania. Its people are engaged in forest industries, and grow rye and potatoes in the cleared areas. The yield per acre, however, is little more than half that of the low-land districts.

3. The **valleys of the Lielupe, or Aa, and the lower Daugava (Dwina)** contain considerable areas of meadow- and plough-land. The former (Zemgale) is the chief wheat district, while the latter is more important for flax.

4. The **eastern upland** is part of the Russian platform, and limestones of Primary age are exposed. Flax occupies more than one-tenth of the total area. Barley is more important than either wheat or oats, and cattle are kept chiefly for meat. Daugavpils (43,000 inhabitants), where the Warsaw-Leningrad railway crosses the Daugava, is the chief town of South-east Latvia.

Latvia differs from Lithuania and East Prussia in the greater extent of surface rocks of Primary age. Limestone and sandstone of Middle Devonian age occur in many parts, and to the west of Riga there are small patches of Jurassic clay. A large part of Latvia is suitable for cultivation, and 60 per cent. of the inhabitants are engaged in farming. As in the other Baltic states, the large estates have been broken up, and intensive farming has displaced the wholesale production of grain and flax. No less than two-thirds of the country consists of farms of less than fifty acres in extent, and the production of meat and dairy produce furnishes about half the income derived from farming. With the single exception of pigs, which depend on grain, all kinds of farm stock have increased in numbers, and the rapid development of sheep-farming is due to the greater use that is now made of waste land. The restoration of the areas devastated by the War and the revolution in agricultural methods have necessitated the construction of 87,000 new farms. In spite of the scarcity of capital the work of reconstruction has made remarkable progress, and while the import of foodstuffs has declined the co-operative dairies, which have been built chiefly to the east of Riga, are responsible for a great increase in the export of dairy produce. In 1913 Russia exported 67,000 tons of butter, Finland 12,800 tons, and Latvia 900

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tons. The corresponding figures at present are Russia 27,200 tons, Finland 13,200 tons, and Latvia 10,000 tons. At the close of the World War the only solvent customer of Latvia was Britain, but with the re-establishment of German credit Latvian butter went to this nearer market. This has tended to stimulate the export of German manufactures to Latvia.

Before the World War Latvia handled 17 per cent. of Russia's total export of timber, and it is the exchange of manufactures and coal for Latvian timber that constitutes the bulk of Anglo-Latvian trade.

Industrial Activity

In 1913 Latvia was one of the chief outlets of West Russian trade, and in consequence its ports developed a number of manufactures using imported coal. During the World War Latvian industries were almost completely destroyed, except in Liepaja, which was occupied by the German Army. Throughout the rest of the country all rolling-stock was removed by the Russians. With the final sundering of Latvia's economic union with Russia the large Latvian industries disappeared, and were replaced by a number of small industrial establishments catering for the domestic market. As 60 per cent. of Latvian industry is centred in Riga the people of that port are anxious to re-enter into close commercial relations with Russia, which is the natural hinterland of the ports of the Eastern Baltic. Commercial treaties have been signed between Latvia and her neighbours, and it is probable that all the Baltic states adjoining Russia will enter into similar agreements.

At the present time the chief industries are the manufacture of agricultural implements, timber industries, including furniture, match and paper manufactures, and the production of cotton and linen yarn. Tanning is developing, and there is a considerable export of hides and leather. The absence of a market for Latvian manufactures is not the only industrial disadvantage. There is a total absence of coal, but this could be overcome if the fall of the Daugava,

ESTONIA

which breaks through the limestone escarpment at Koknese (Kokenhusen) in a series of picturesque rapids, were harnessed. It is estimated that 300,000 electrical horse-power could be utilized during nine months, and 120,000 electrical horse-power during the low-water season. Absence of capital has hitherto prevented the utilization of this power, which would enable the railways to be electrified and electro-chemical and electro-metallurgical industries to be developed.

Toward the end of 1927 Latvia entered into a commercial treaty with Russia by which the import of raw materials from and the export of manufactures to that country would be facilitated. This should have the effect of restoring Latvian industry and trade, for without access to the Russian market Latvia cannot become economically independent. In pre-War days Latvia supplied a considerable proportion of the *personnel* of the medical, educational, and veterinary services of European Russia. However, in view of her present educational policy Russia no longer requires the services of large numbers of Latvian professional men.

ESTONIA

The low-lying country occupied by the Estonians, who resemble the Finns in both race and language, stretches from Latvia to the Gulf of Finland. On the east it is bounded by Lake Peipsi (Peipus) and the Narva river. As in the case of the other Baltic states, the climate of Estonia shows a gradual transition between the maritime conditions of the Baltic coast and the continental condition of Northern Russia. An average summer temperature of only 50° F. is an indication that Estonia is near the northern limit of cultivation of food crops. Both winter and spring are cold, and though the low rainfall (twenty-one inches) allows rye and oats to ripen more than half the arable area is under hay and fodder crops. Twenty-three per cent. of Estonia is arable, 41 per cent. is meadow and pasture, forests occupy 20 per cent., while about 16 per cent. is waste land, bogs, and lakes. The chief cereal crop is rye, though this is declining

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in consequence of the development of dairy-farming. More than a quarter of the food grain consumed in the country is imported, and considerable areas which could produce food grains are now under potatoes and flax. As in Russia, the area under flax decreased during the World War, and the impossibility of finding a market led to the linseed being crushed for cattle-cake. Before the War more than one-fourth of the potato crop was used for the manufacture of alcohol, but since 1919 the consumption of spirits has declined, and the crop is chiefly used for food and in stock-rearing. There is a small surplus for export. The importance of livestock in Estonia is shown by the following table:

Country	Horses		Cattle		Pigs	
	Total	Number per 1000 Inhabi- tants	Total	Number per 1000 Inhabi- tants	Total	Number per 1000 Inhabi- tants
Denmark .	598,000	183	2,590,000	793	1,430,000	332
Holland .	369,000	53	2,063,000	301	1,519,000	222
Sweden .	716,000	122	2,551,000	436	717,000	123
Switzerland .	134,000	35	1,425,000	369	639,000	165
Estonia .	226,000	205	599,000	545	333,000	301

A few live cattle and a small amount of meat are exported, but the chief development is in the co-operative dairy system. Not only has the number of cows increased, but the yield per cow is increasing, and it is probable that the export of dairy produce and eggs will become even more important. Four-fifths of the butter exports go to Germany, and the rest to Britain. The flax exported is shared by Britain, Belgium, France, Germany, and Finland.

Physical Sub-regions

1. The **coastal lowland** is a low-lying plateau ending in steep limestone cliffs in the north and north-west along the Gulf of Finland, which occupies the boundary between the Archæan Finnish plateau and the Primary rocks of Estonia

ESTONIA

(*cf.* the *glint line* in Scandinavia). Unlike Finland, where practically the whole surface is Archæan, the Primary area of Estonia exhibits a considerable variety of rocks. On the islands, and in Northern Estonia, the surface consists of sandstones and limestones, beds of oil-shale being found in the latter. This oil-shale is quarried between the northern coast and the Tallinn-Narva railway, and is used in the form of pebbles for fuel in the factories, in the cement-works at Port Kunda and Azeri, in the gasworks at Tartu (Dorpat), and on the railways. The chief single use of oil-shale is in central heating, and the reserves are estimated to be equivalent to 2,250,000,000 tons of coal. The shale is also distilled, and produces a fuel oil which can be used in boilers and Diesel engines. About 400,000 tons are mined annually, the State refinery being at Kohtla. Nevertheless, Estonia is still compelled to import considerable quantities of coal.

Though the lowland districts are largely dependent on agriculture the chief market towns rely to a considerable degree on their manufactures. Practically all the larger towns manufacture leather and linen yarn, and there are several paper-mills. As in the case of Latvia, much of the machinery was destroyed during the War, and tariffs have been framed to protect the home market. Before the War Estonian industries depended entirely on Russia, and the closing of this market has paralysed Estonian export manufactures.

In 1913 there were five shipyards, and the machine-works produced agricultural machinery and electrical equipment for the Russian market. The number of workmen employed in these and in the cotton, linen, and woollen mills has been reduced by half. On the other hand, the amount of flax produced for export has reached pre-War levels.

Tallinn, or Reval (130,000 inhabitants), gained importance largely on account of the trade which passed through it between Russia and the outside world. Its position has been coveted in turn by Danes, Germans, Swedes, and Russians. As a Hanseatic town it gained control of the external trade of Russia, and as it was held for centuries by the Teutonic Knights its inhabitants are principally Roman Catholics (*cf.* Latvia, where more than half the

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inhabitants are Protestants). Its modern development was due to its railway connexions with St Petersburg (Leningrad) and Moscow, and to its use as Russia's principal naval dockyard.

Both the Gulf of Riga and the Gulf of Finland are blocked with ice during the winter, but the Gulf of Riga is blocked for only two or three months, and as its ice does not shift about its port can be kept open by ice-breakers, whereas in the Gulf of Finland the winds pile up the drift-ice and render navigation impossible for a much longer period. Tallinn formerly acted as the winter port of Russia when Riga and St Petersburg were frozen, but as it is itself frozen in for forty-five days the outport of Baltiski, which is frozen for thirty days, was developed. Vilsandi, on the western shore of the island of Saaremaa, is completely ice-free, but has no docks. It is clear, therefore, that the trade of the Northern Baltic is seasonal, and may be compared with that of the St Lawrence. The occupations are seasonal, timber-cutting taking place in winter, rafting in spring, and exporting in summer. Tallinn also possesses large grain elevators, but at the present time there is no export of wheat. The total amount of imports landed is now less than 1,000,000 tons. It is possible that with the reopening of close commercial relations with Russia and the construction of a new railway to Pskov Tallinn would obtain a share in the trade of North-west Russia and its cotton-mills would regain their importance.

Pärnu, or Pernau (22,000 inhabitants), on the Gulf of Riga, shares in the export of timber and flax. It is the chief centre of the woollen industry.

Narva-Jõesuu (Hungerburg), the outport of Narva (27,000 inhabitants), exports timber. Narva itself is important for textiles, the electrical power for its cotton-mills being derived from the Narva Falls.

2. The **upland districts** of the south, centre, and east consist of Primary rocks which are partly concealed by moraine material, which stretches in broad, well-wooded ridges from south-west to north-east. These hills are deeply trenched by streams which flow into the lakes of the Russian border. Though this region possesses a considerable amount of un-

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developed water-power economic conditions do not warrant its full development at the present time. Tartu, or Dorpat (67,000 inhabitants), lying midway between Lakes Virts and Peipsi, is the chief market town of Central Estonia. Its university was established during the relatively enlightened period of Swedish rule in the seventeenth century.



FIG. 124. NARVA FALLS AND MILLS

Hydro-electric power is used in the cotton-mills of Narva.

By courtesy of the Estonian Legation

It is a centre of the timber and pulp industries of Central Estonia, and manufactures electrical apparatus and leather goods.

FINLAND

Finland is a borderland between the East and the West. In respect to climate and physical structure it forms an isthmus linking the Scandinavian peninsula to the great continent of Eurasia. The civilizations of Eastern and

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Western Europe meet there, while the Protestant and Greek Churches have vied with each other in preaching their faiths. More important, however, has been the struggle between Sweden and Russia for possession of Finland. In the past Swedish influence was strong, but it was Russian oppression which fanned the flame of revolt so that the literary revival became a movement for national independence and culminated when the World War broke the power of Russia (*cf.* the Irish Free State and Czecho-Slovakia). Relations with Sweden are peaceful, and it should be noted that the Åland Islands, which are owned by Finland but occupied by Swedes, are entirely unfortified.

Nine-tenths of the people of Finland belong to the Finno-Ugric race, and, unlike other Baltic states, there is no minority problem. The Carelians in the east extend into Russian territory along the White Sea. They are a branch of the Finnish race, as are the Estonians to the south of the Gulf of Finland. There is a large Swedish element in the coast towns, which have both Swedish and Finnish names, and where the two languages are spoken. The Finns settled in the country at the beginning of the Christian era, and practically the whole nation is Lutheran.

Physical Sub-regions

1. The coastal lowlands extend from the north of the Gulf of Bothnia to the head of the Gulf of Finland. This area is a recent coastal plain. More than two-thirds of the inhabitants live in this coastal strip, which comprises less than one-eighth of the total area and contains most of the cultivated area of Finland. Agriculture is hampered by August frosts, and the Finns can grow only a small amount of the grain they consume. Something has been done to get rid of frost fogs by draining the marshes, and some oats, rye, and potatoes are grown, but the main feature of Finnish agriculture is the increasing importance of cattle-farming. The number of cattle (1,800,000) is practically equal to that of Belgium. Nearly 20,000 tons of butter are exported annually, chiefly to Great Britain. About 10 per cent. of the

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milk is converted into 'Gruyère' cheese, of which 5000 tons are exported.

It is not, however, to agriculture alone that the Baltic

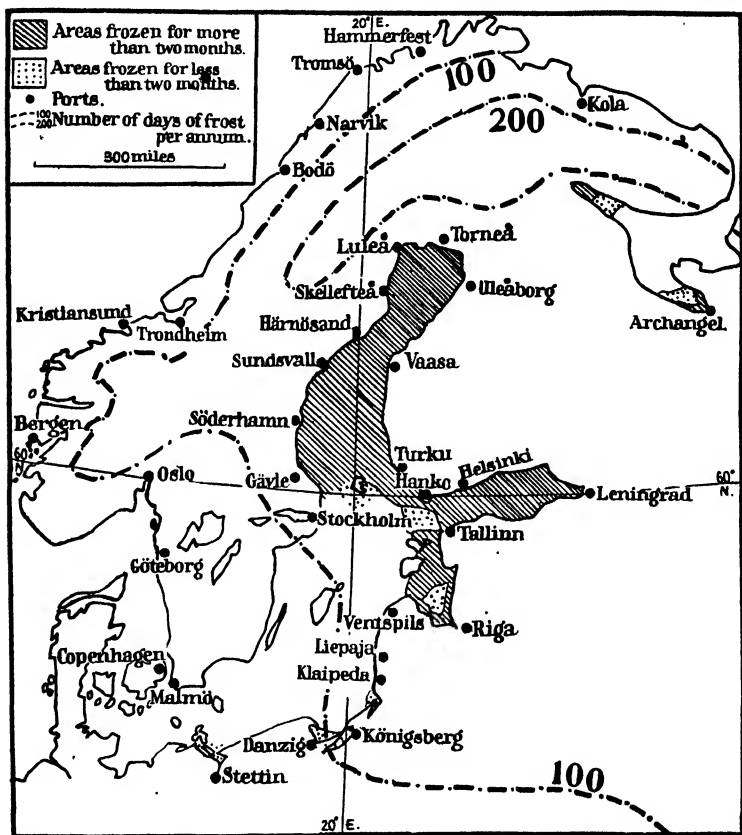


FIG. 125. WINTER ICE IN THE BALTIC SEA

Identify the ports closed in winter.

coasts of Finland owe their importance. Although 65 per cent. of the population is engaged in agriculture industrialization is rapidly increasing. Finland has about 2,500,000 potential horse-power, and there is sufficient to supply the industrial needs of the country for an indefinite time. The

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greatest need for development, however, lies in the more densely settled region, and it is in the south and west that hydro-electric power has been developed in connexion with lighting, traction, and manufacturing. A new power-line is being constructed to connect the Imatra power-station to Turku (Åbo), with a branch-line to Helsinki (Helsingfors). Already there are 300 electrical power-stations, which supply power to the great sawmills and to the ports.

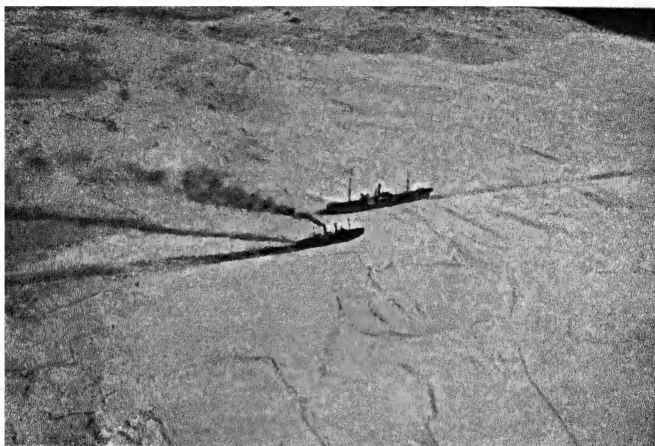


FIG. 126. AN ICE-BREAKER IN THE GULF OF FINLAND

By courtesy of the Olava Publishing Company, Helsinki

Helsinki, or Helsingfors (234,000 inhabitants), was founded by the Swedes as their sixteenth-century trading-station at the mouth of the Gulf of Finland. Because it was easily defended it became the capital in place of Turku (Åbo). Its relative freedom from ice has made it the principal port, with an ice-free outport at Hanko (Hangö). It is the only warehouse port, with more than 40 per cent. of the total imports, which consist of textiles, metals, machinery, oil, cotton, wool, and sugar, and consequently it has become the chief manufacturing centre, the chief industries being paper, pulp, sugar, tobacco, and food manufactures. The export trade, however, which consists largely of timber and wood-

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pulp and paper, is distributed between a number of ports, of which the chief are Turku, or Åbo (65,000 inhabitants), which shares in the woollen industry of Helsinki, Viipuri, or Viborg (55,000 inhabitants), Vaasa (25,000 inhabitants), Oulu, or Uleåborg (24,000 inhabitants), and Pori, or Björneborg (18,000 inhabitants).

2. The **Archæan plateau** of Finland, which extends from near the south coast (latitude 60° N.) to the Murmansk coast (latitude 70° N.), was near the centre of maximum glaciation during the Ice Age. Great tracts have been worn smooth, and except in the north-west of Lapland the plateau does not rise above 4000 feet. It is only in the uplands between the Gulf of Bothnia and the Arctic Ocean that high tundra or fjeld conditions occur, though for about twelve miles from the Arctic coast the vegetation consists chiefly of dwarf-birches and creeping juniper. The Arctic coast has little but lichens and mosses. The settlements of Lapland are found near the mouths of the swiftly flowing rivers, where the first nomadic Lapp fishermen established themselves. The number of Lapps is small, probably not more than a thousand, and though there are large numbers of reindeer in Finland they are chiefly the property of the Finns. Finland acquired this foothold on the Arctic coast by negotiations with Russia in 1920, in order to obtain an ice-free port at Pechenga, which is to be connected with the railway system of Southern Finland. It is toward the centre and south of the Fenno-Scandian plateau that the results of glaciation are most important. Here the ice-sheet made great depressions and clefts, which are now occupied by long, narrow lakes bounded on the south by narrow ridges of terminal moraine, which marked stopping-places in the melting of the ice. Sixty-four per cent. of Finland is under forest, and water covers 11 per cent. of the total area. The scenery of Central Finland is extraordinarily beautiful, and in many places half the area of each parish consists of lake. Under such conditions boats form the chief means of communication, and the Finns have become one of the great maritime nations, especially in the handling of wooden ships. Many of the lakes have been joined by short canals.

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Throughout the central and southern parts of the plateau lumbering is the chief industry, and Kuopio (24,000 inhabitants) has one of the largest match factories in the world. The great Saima Lake system stretches for nearly 200 miles along the south-eastern frontier, and is connected by the Saima Canal with the Gulf of Finland at Viipuri. More than 10,000 vessels pass through it each year, and it is of the greatest importance to parts of Carelia which have no railways. In the south-west of the plateau Lake Näsä is a natural reservoir for the hydro-electric station at Tampere, or Tammerfors (55,000 inhabitants), the largest inland town, and the centre of the cotton, linen, woollen, and engineering industries. Though the water-power is used the chief reason for this town's industrial activity was due to special privileges granted in 1810. The early industrial experience gained by its people has attracted other industries. The loss of the Russian market has hindered the expansion of the textile industry, but home consumption has increased, so that the output has reached pre-War levels.

With the exception of Russia, and possibly of Poland, Finland is the only European country which cuts less than its annual growth of timber. Its great forests, the heavy snow-fall, the large number of lakes, and the vast amount of easily developed water-power combine to make Finland the second greatest lumber-exporting country in the world.

APPENDIX I

AREAS, POPULATIONS, AND TRADE OF THE COUNTRIES OF WESTERN EUROPE IN 1929¹

Country	Area (in Thousands of Square Miles)	Population (in Thousands)	Value of Imports (in Millions of Pounds)	Value of Exports (in Millions of Pounds)
Belgium . . .	12	8,060	204	185
British Isles . .	122	49,293	1,222	730
Danzig . . .	7	407	20 (by sea)	16
Denmark . . .	17	3,542	99	89
Estonia . . .	18	1,115	7	6
Finland . . .	133	3,634	36	33
France . . .	213	41,130	470	404
Germany . . .	182	63,635	699	723
Holland . . .	13	7,832	229	166
Latvia . . .	24	1,900	14	11
Lithuania . . .	20	2,230	6	7
Norway . . .	125	2,890	59	41
Poland . . .	150	30,213	72	68
Sweden . . .	173	6,120	98	100
Switzerland . .	16	4,067	111	84

Rates of exchange adopted: French franc, 124; Belgian franc, 174; Swiss franc, 25; Finnish mark, 193; German mark, 20; Danzig gulden, 25; Scandinavian krona, 18.

THE TRADE OF WESTERN EUROPE AS AN ECONOMIC REGION IN 1925

Value of internal trade, £1,522,000,000 (57 per cent.). Value of external trade, £1,145,000,000 (43 per cent.). The percentage of imports from other Western European countries was as follows: Belgium, 56 per cent.; Britain, 23 per cent.; Denmark, 58 per cent.; Estonia, 57 per cent.; Finland, 75 per cent.; France, 33 per cent.; Germany, 36 per cent.; Holland, 57 per cent.; Irish Free State, 86 per cent.; Latvia, 75 per cent.; Lithuania, 79 per cent.; Norway, 68 per cent.; Poland, 67 per cent.; Sweden, 69 per cent.; Switzerland, 59 per cent.

¹ In some countries for 1930; Great Britain 1931.

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Direction of External Trade of Western Europe. Only 27·5 per cent. of the exports went to the rest of Europe, which remains one of the greatest undeveloped markets for Western European manufactures. 38·4 per cent. of the exports went to West European dominions and colonies and the United States, but as these are rapidly developing their own industries they offer less prospects as markets for European manufactures. Monsoon Asia took 13·1 per cent. of the exports, and the rest of the world 21 per cent. It should be noted that the European dominions and colonies purchase more than twice as much per head of population as the non-industrialized European countries. The latter are underdeveloped, but offer a rich field for commercial and industrial enterprise. Unfortunately they have twenty languages, whereas in Western Europe there are three main commercial tongues. Their communications are poor, their peoples illiterate, and some of their Governments hopelessly inefficient.

BALANCE OF TRADE IN WESTERN EUROPE IN 1925

—	Net Imports	Net Exports
Foodstuffs . . .	£1,094,000,000	£346,000,000
Raw materials . .	£1,306,000,000	£444,000,000
Manufactured goods .	£594,000,000	£1,439,000,000
Invisible exports (shipping services, etc.) .	—	£765,000,000

APPENDIX II

CLIMATIC DATA

I. TEMPERATURES IN DEGREES FAHRENHEIT

Place	Altitude in Feet	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Valentia . . .	30	45	44	45	49	52	57	59	59	57	51	48	4
Fort William . . .	171	39	39	40	45	50	55	57	57	53	47	44	4
Ben Nevis . . .	4406	24	24	24	28	33	40	41	40	38	31	29	2
Scilly Isles . . .	131	46	43	46	49	49	58	58	61	51	59	50	5
London . . .	152	39	40	43	48	54	60	63	63	58	50	44	4
Bergen . . .	72	34	34	36	42	49	55	58	59	52	45	39	3
Trondheim . . .	70	26	26	31	39	46	54	57	56	49	41	34	2
Stockholm . . .	146	27	26	30	38	48	57	62	59	53	43	35	2
Hamburg . . .	82	33	33	37	45	53	60	63	62	57	48	39	3
Berlin . . .	196	30	33	38	47	57	64	66	66	68	49	39	3
Munich . . .	1739	27	30	36	45	53	60	63	62	55	46	36	2
Lyons . . .	574	36	40	46	54	60	66	70	69	68	53	44	3
Marseilles . . .	246	43	45	49	55	61	68	72	71	66	58	50	4
Warsaw . . .	390	26	27	32	45	59	63	66	64	56	46	35	2
Helsinki . . .	39	12	20	19	35	46	58	63	60	52	42	32	2

CLIMATIC DATA—continued

II. RAINFALL IN INCHES

Place	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
Valentia . . .	5.5	5.2	4.5	3.7	3.2	3.2	3.8	4.8	4.1	5.6	5.5	6.6	56
Fort William . .	9.6	7.4	6.6	4.4	3.9	3.5	4.8	6.1	6.3	7.0	8.0	10.1	78
Ben Nevis . . .	18.3	13.6	15.3	8.5	7.9	7.5	10.8	13.3	15.7	15.4	15.4	19.0	161
Scilly Isles . . .	3.0	2.6	2.4	1.9	1.7	1.7	2.2	2.6	2.4	3.7	3.3	4.4	32
London	1.7	1.6	1.7	1.5	1.7	2.0	2.2	2.2	1.8	2.5	2.3	2.2	23
Bergen	7.5	5.8	5.8	3.4	4.3	3.7	6.3	7.3	10.5	9.5	8.2	8.3	81
Trondheim . . .	4.3	3.0	3.4	2.5	2.2	1.9	2.8	3.4	4.4	5.0	3.9	3.4	40
Stockholm . . .	1.5	1.2	1.4	1.4	1.5	1.7	2.4	3.0	1.9	1.9	1.9	2.0	22
Hamburg	2.0	1.5	2.0	1.5	2.0	3.0	3.5	3.0	2.5	2.5	2.3	2.5	28
Berlin	1.5	1.5	1.7	1.5	1.9	2.5	3.0	2.2	1.7	1.9	1.7	1.8	23
Munich	1.2	2.2	2.5	2.5	4.0	4.7	4.7	4.5	3.0	2.5	2.0	2.0	35
Lyons	1.2	1.5	2.0	2.5	3.2	3.2	3.5	3.2	3.0	3.7	2.5	2.0	32
Marseilles . . .	2.0	1.2	1.5	2.0	1.5	1.0	0.5	1.0	2.0	3.5	3.0	2.0	21
Warsaw	1.0	1.0	1.2	1.5	2.0	3.0	3.0	3.0	2.0	1.5	1.5	1.5	22
Helsinki	1.5	1.2	1.1	1.2	1.8	1.6	2.4	2.8	2.4	2.6	2.4	1.8	23

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